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Transmission of electricity on one conductor to an isolated object

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Ваша оценка:

• Аннотация:

In this article possibility of transfer of electric energy and/or information to the object isolated from Earth or from other carrying-out body on one conductor, and short history of this question is discussed. Some electric circuits of such electricity transmission are given and it is defined to what physical mechanism (a single-wire electricity transmission), according to the author, corresponds. Attempt of calculation of the transferred power and relative loss of energy is made. The author gives possible ways of increase in power and reduction of losses, and also protection against an adverse effect of such electricity transmission on a human body. In article there is a description of the conducted experiments. Also in article it is possible to read what, according to the author, are possible areas of practical application, advantage and shortcomings of transfer of the electric power on one conductor. The author apologizes, that not all declared chapters are published. Subject very extensive, in essence, rather new area of electrical equipment while there is a work, he decided to take out that on court of readers that is already ready.

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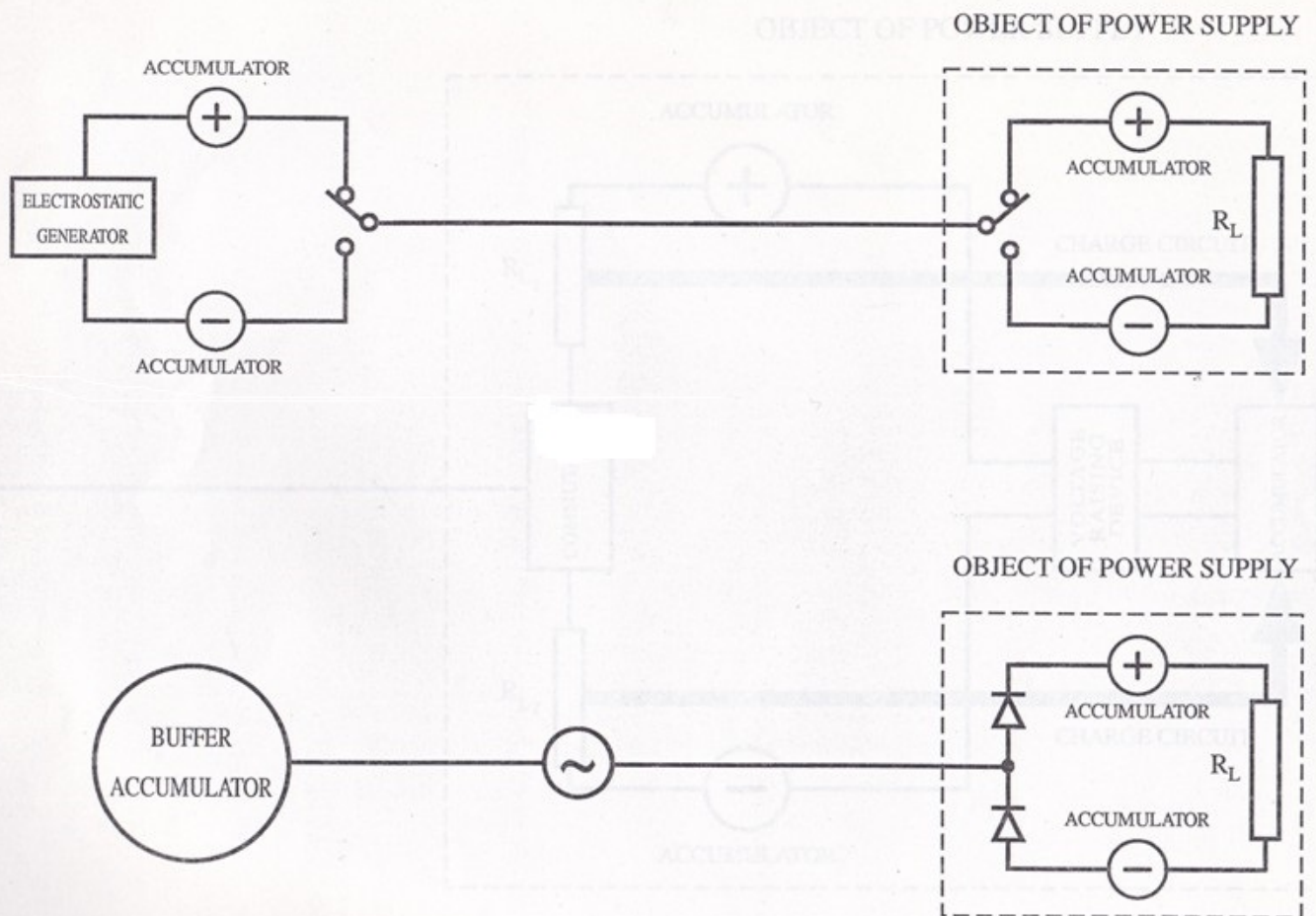
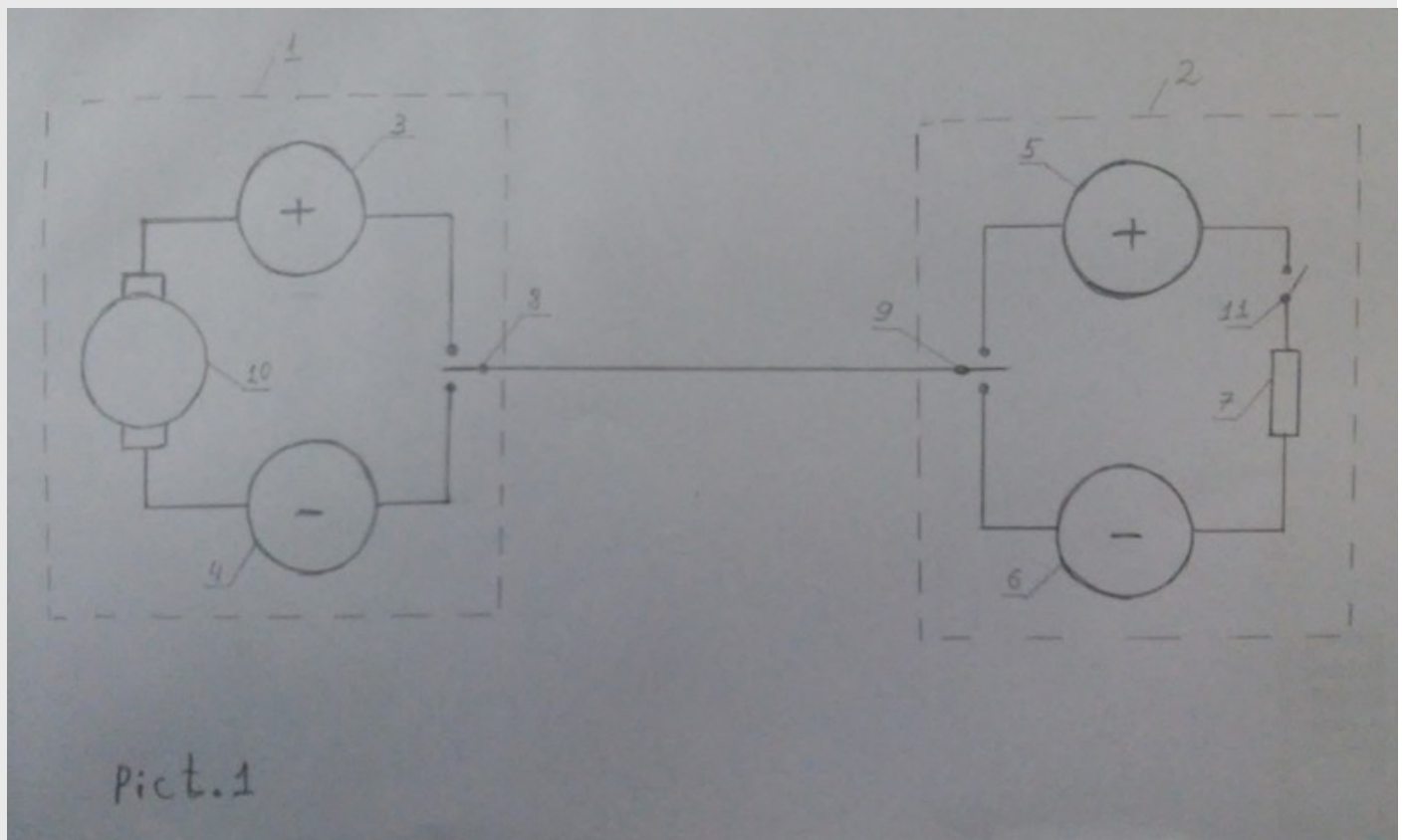
CHAPTER 1. MECHANISM OF A SINGLE-WIRE ELECTRICITY TRANSMISSION.

The first experiments on transmission of the electric power on one conductor were made at a dawn of formation of the theory of electricity at the end of the 18th century. It is possible to find the description of experience in which the charged full-sphere (transmitter) connects to the uncharged full-sphere (receiver) one conductor in any solid textbook of physics. On the uncharged full-sphere charges flow, it becomes the owner of electric potential and consequently also energies. But except as contribution to the theory of potentials and condensers, for development of the theory of a single-wire electricity transmission and practical use this experience then brought nothing.

In 1899 Nikola Tesla in laboratory about the town of Colorado Springs made brilliant experiment on transfer of the electric power on one conductor, he used Earth as such conductor. The lamps thrust to Earth were lit. On my understanding, he made it using, in some measure, the above described experience. Results were reflected in article in the 'Century Magazine', magazine under Robert Johnson's edition.

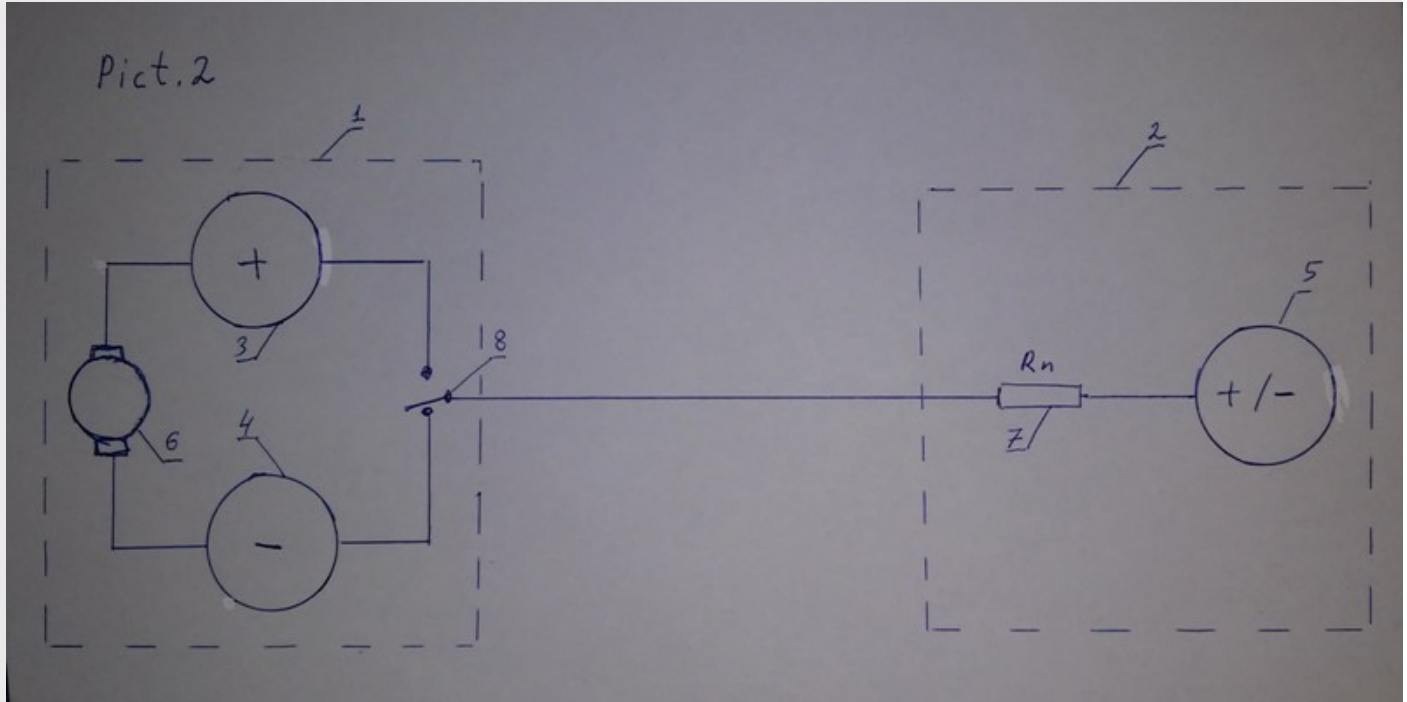
But, unfortunately, demonstrations of experiences are the limit, further affairs did not progress. And it occurred, owing to circumstances, that not depend in him. Further this Titan put a problem more widely. He tried to find a way, and probably found, how to transfer the electric power to any given square of space in general without wires by means of resonance "swing" of an ionosphere. Made successful experiments in Uordenkliff. Therefore, he is a father of wireless transfer of the electric power which now too goes uphill.

Somewhere around 1981 I, then a young engineer working in one of the Soviet research institutes, in connection with the above experience from the textbook, came up with this idea. And what if you take 4 sphere and one conductor? See Figure 1.



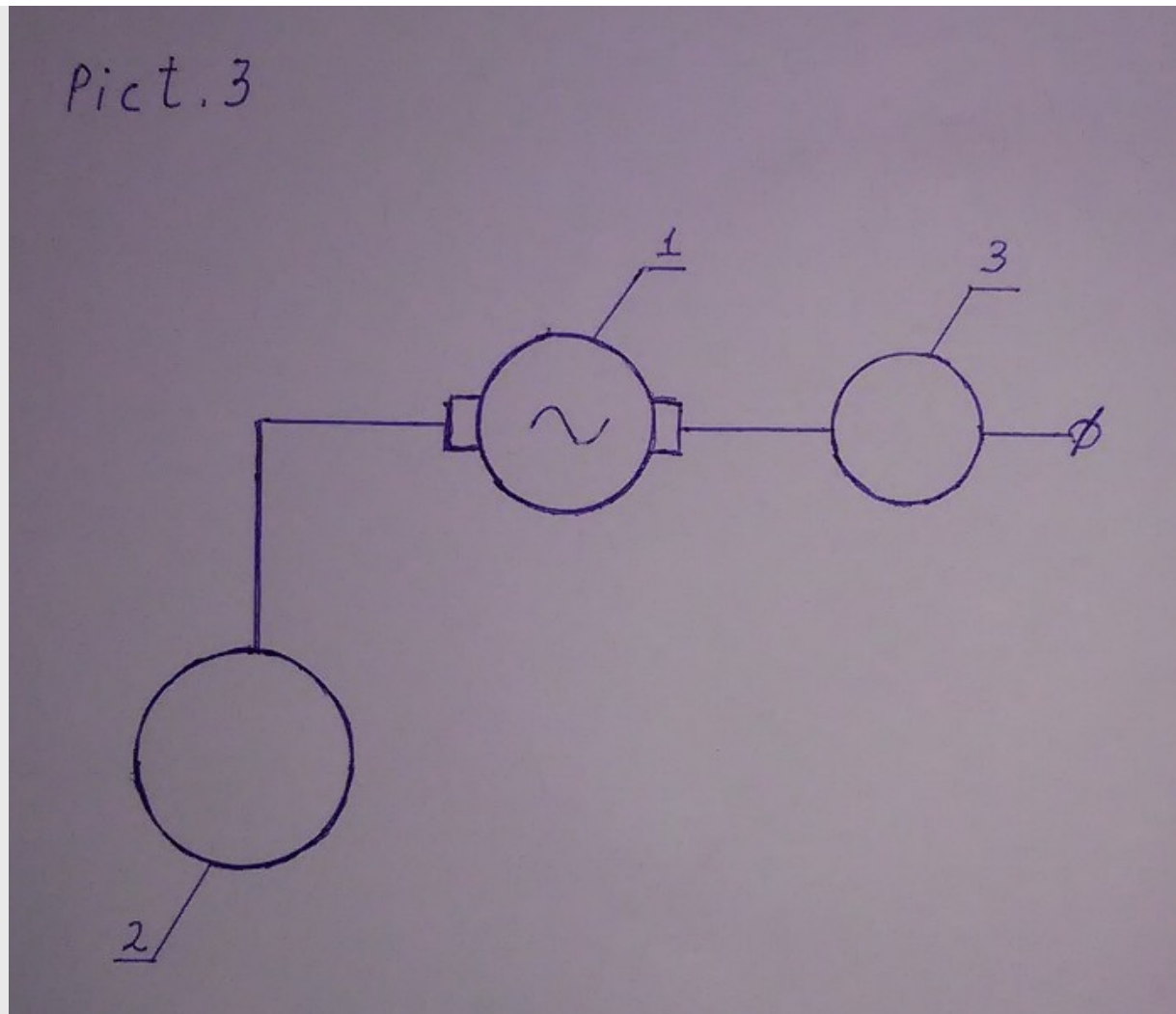
Two spheres (5 and 6) won't be loaded yet and to be on the receiver (2), and two loaded (3 and 4) one plus charges, and the second the minus - to belong to the transmitter (1). Then, working cyclically with switches (8 and 9), it is possible to connect in the first half of a cycle the same conductor the first loaded sphere (3) with not loaded (5), and in the second - the

second loaded sphere (4) with another not loaded (6). Thus, at the end of a cycle we will receive two loaded spheres on the receiver, and charges can be removed from them through the payload (7), having involved the switch (11). We will feed transmitter spheres with charges all the time, having connected them, for example, to the battery, the generator of a direct current (10) or an influence machine. It is the first way of single-wire transfer. Subsequently, in operating time over this subject, also the second way, and simpler appeared. See Fig. 2.

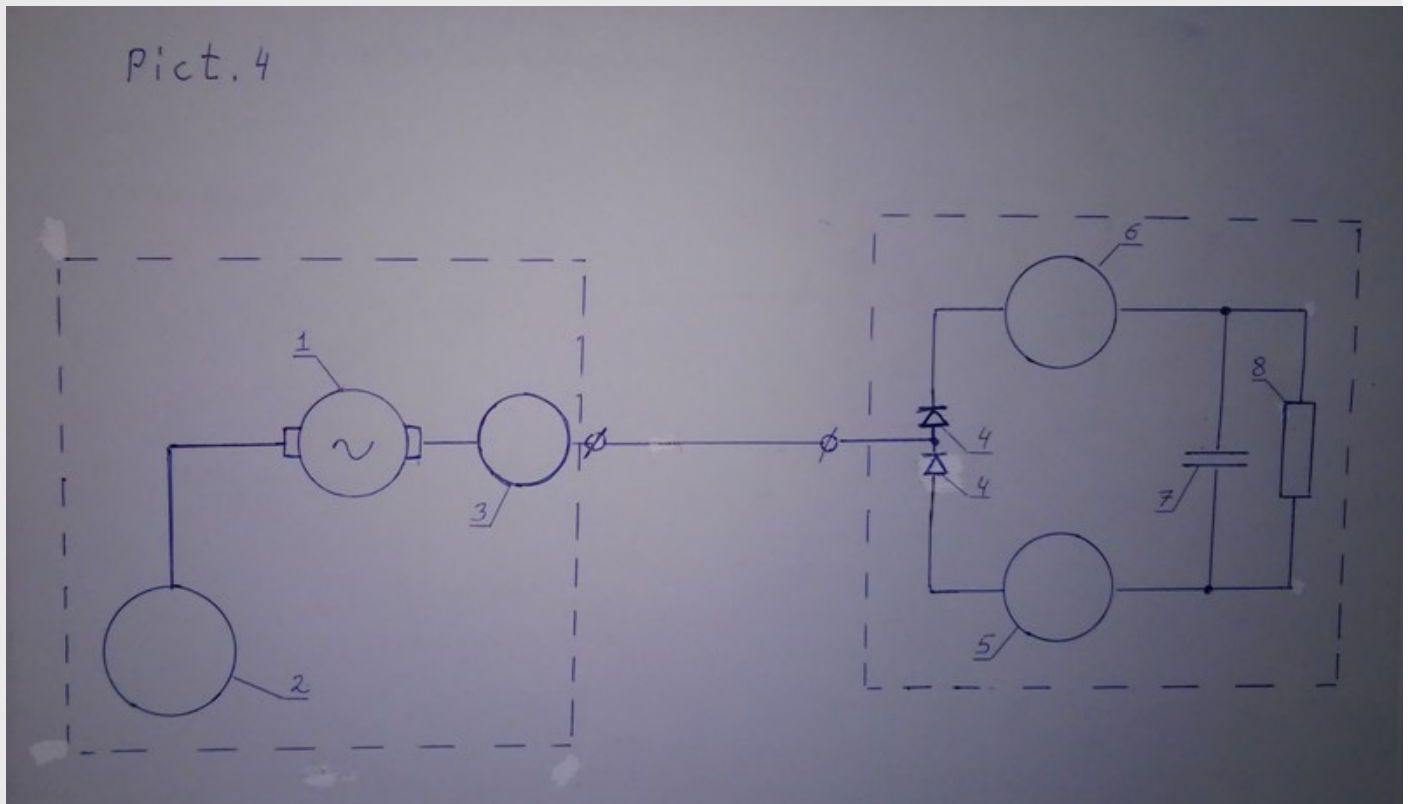


On the receiver (2) it is possible to leave only one store of electric charges (5) (in the text we will call spheres - stores of electric charges or it is simple - stores especially as stores aren't obliged to be a spherical form), but (7) we will place payload between it and the conductor going from the transmitter (1) now. Working with the switch (8), as well as at the first way, we connect alternately stores of the transmitter (3 and 4) to one conductor going to the receiver. The receiver store in each half-cycle of a cycle will receive charges of a different sign. And passing charges, every time a way from source stores to the receiver store, will make useful work, passing as well through load. Transmitter stores are recharged from the generator of a direct current (6) all the time. The continuity of transfer of current is provided to these. From the further text of article it will be clear that for the second way as load it is best of all to use, a winding of the transformer or an electric motor/electromagnet with the rectifier as thermal work won't be made. But if we want to receive, nevertheless, on the receiver heat on resistance, this resistance should be connected to a secondary winding of the transformer, and primary as it was told above, then to use as load.

Subsequently, for increase of overall performance and convenience, the scheme 1 and 2 underwent big changes. The transmitter in both schemes began to be the following device*. See Fig. 3.

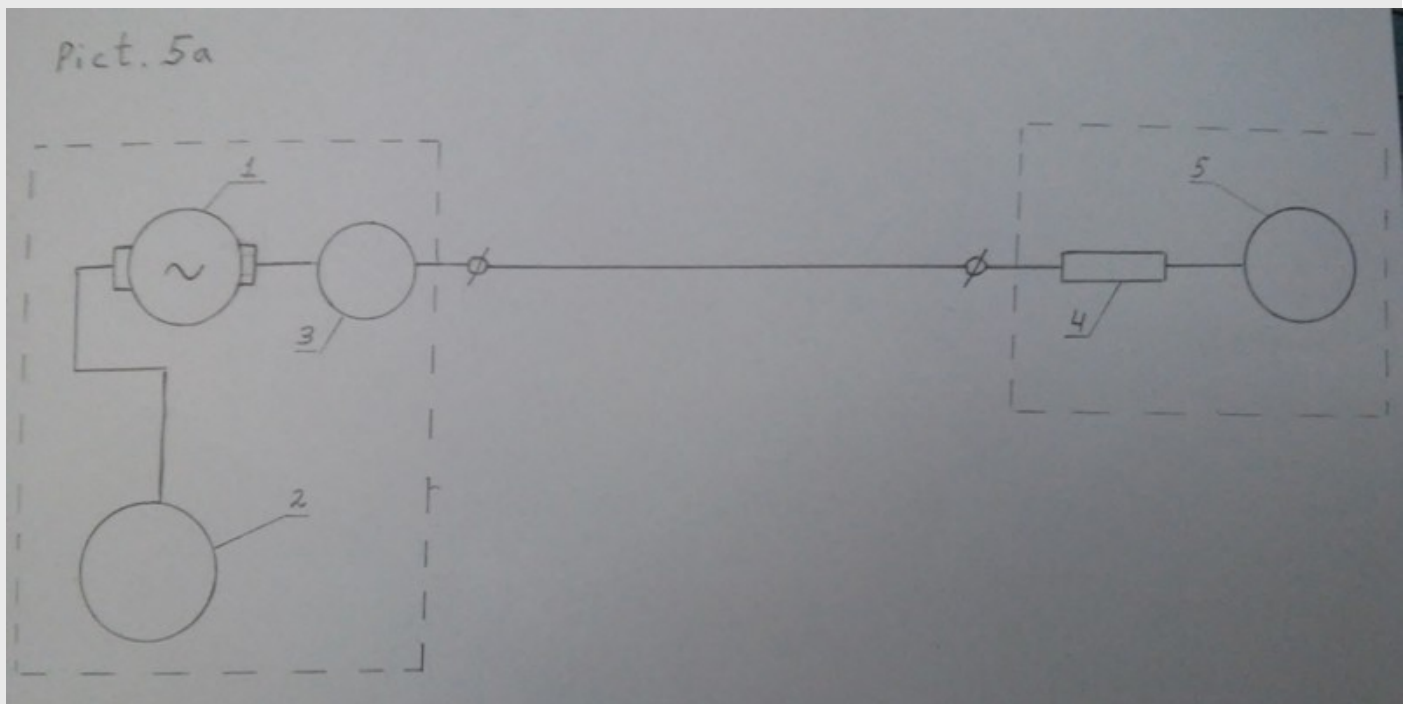


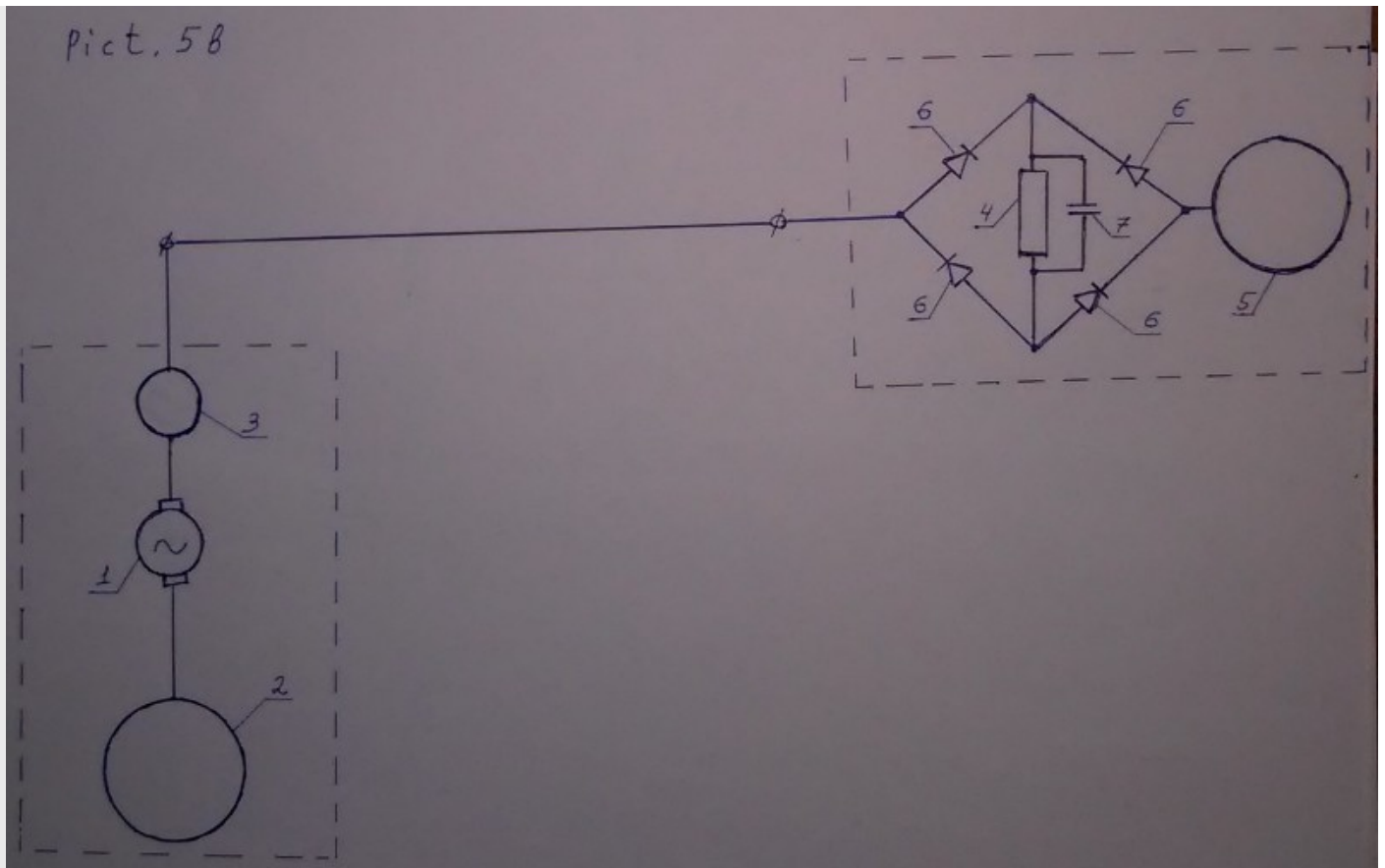
It is necessary to emphasize that here the generator of alternating current (1), but not constant already works. The store (3) transmitters from which charges for the conductor going to object of current supply not necessarily are removed has to possess big capacity, if receipt of charges from the generator continuously. In this case it can represent simply thin conductor. In case of faltering giving of charges from a source, its capacity has to be such that for a half-cycle not to allow essentially to fall to potential on it at "fence" of charges through the conductor on the receiver and interruptions in giving of charges from the generator. At such option its capacity and respectively the geometrical sizes, have to be at least 10 times more receiver store parameters. If interruptions small - that and the sizes modest. And here other store of the transmitter called in this article "buffer" (2), connected to its other conclusion even during the continuous operation of the generator has to possess rather big capacity and corresponding the big geometrical sizes. Its capacity has to be such that it at the set transfer of current potential (generator parameter) during a half-cycle could store so many charges of an opposite sign transferred, how many perceives the receiver store. That is in any way it isn't less than a capacity and according to the geometrical sizes of the store of the receiver. If it is more, it is only better. On Earth, a very good fit Earth itself - the spherical capacitor with huge geometric dimensions. That is, the second terminal of the generator, if conditions permit, the easiest way to ground **. The switch (9) in the first scheme (see Fig. 1) it was convenient to replace with a two diode switch 'diode fork' (4) (see Fig. 4).



The switch (11) (see Fig. 1) in the same scheme was not necessary.

So, we will consider the modified schemes. The scheme for the first way of an electricity transmission is submitted in Fig. 4, and for the second in Fig. 5a. In the first way, for the smoothing proceeding through loading (8) (see Fig. 4) current, it is useful to connect the condenser (7) (see Fig. 4) parallel to this load. And as for the second way if we want that through load current of one direction began to flow, it is possible to use the diode bridge (6) (see Fig. 5b) and, besides, for smoothing to connect parallel to load (4) (see Fig. 5b) the condenser (7) (see Fig. 5b). This scheme is submitted in Fig. 5b.





It is necessary to tell that as work on this subject didn't include in the plan of works of my scientific research institute, and I saw off it as a hobby, it moved ahead extremely slowly. During the researches I often went on consultation to Candidate of Physical Sciences Kirsanov Boris Petrovich and he made a big contribution to development of schemes and theories. In 1981/3 years I with Kirsanov B.P. submitted applications for inventions [5,6](photocopies at the end of the article). But experts of VNIIGPE didn't grant to us certificates, having referred to the low transferred power in our pilot unit executed according to the scheme of Fig. 4. But we experimental installation collected for the only purpose - to prove course of current in load, possibility of that was denied by experts absolutely at the first stage of ours with them communication. Then (in 1989) I with assistance of Kirsanov B. P. wrote article to the Inventor and Rationalizer magazine [1](photocopy at the end of the article). Soon after publication of my article it became clear that in parallel with us this subject is developed also by other people.

Group of inventors under the leadership of S. V. Avramenko under the auspices of Moscow Scientifically - Research Electrotechnical Institute collected and experienced installation on transfer of the electric power on one conductor [2,3]. This installation is very similar on thought up by us with Kirsanov B. P. and published in the magazine [1]. In this article this installation is represented in Pict.4. They claimed that they made it before date of issue of our article. And that submitted the article to the same magazine, but didn't publish it. I won't argue with it. I will tell only, as at us before the publication installations too were collected and applications for inventions are submitted. I do not know how things are going with the priority, but that they are in the works, after our meeting and reading my article about something we have not mentioned, I think it ugly

As for their works, I think that they placed accents not there. Too great value was attached to a two diode switch 'diode fork' though the same results can be received and without it with synchronous switches. They worked (their installation) at very high frequency. Subsequently, from the text of this article it will be visible that it reduces efficiency of transfer and in general is harmful. But they collected very impressive pilot unit, I myself personally observed - it was possible to light the glow lamp.

Great merit of this group of people I see that they first drew attention to the fact that the single-wire transmission of electricity resistance of a conductor does not affect the transmit power. Furthermore, the transfer of electricity and do not affect the small gaps in the conductor cm. [4]. And I do not understand why these inventors have not submitted an application for discovery in the field of physics. As far as the physical process, it can be assumed that we are faced with a different mechanism of passing an electric current through a conductor. The charges are on the outer contour of the conductor, seeking to redistribute equipotentially throughout, even very distant surface. They do not go into the conductor and not get hit by the vibrating atoms of its crystal lattice. Nothing however retards the electrons and the conductor resistance is negligible regardless of its thickness and the material from which it is made. In experiments carried out in the writing of this article, such a property is supported by a series of experiments ... In addition, if the free electrons are facing

a narrow "abyss" - a break in the conductor, the repulsion "accumulates" neighboring electrons helps them to "jump" through the "cleft" and "land" to "sparsely" surface.

As for later works, Kosinov N. V. article is interesting [2]. I consider this work among works of other authors the most advanced, it is possible to see the scheme very similar on presented on Pict.5b. Here for the first time, if to speak about works of other authors, in an explicit form there is a receiver store called for some reason "antenna". However, at such big frequency at which as I suspect, experiments and about which they for some reason "modestly are silent" were made, most likely it already radio frequencies, such name arises by itself. And that is "still interesting", about its (store) of a role in this work, for some reason, it is told nothing. And in general, looking through literature on this subject I see that as stores connecting wires, and authors of works, it seems, even serve don't guess their such function. Stores with small own capacity, like wires also will be suitable for high frequencies, but whether here it is worth working with high frequencies is a big question.

NOTES.

* For the elementary experiments as the transmitter it is possible to use one conclusion of the socket of the household power supply network, i.e. to insert one conductor into the right opening of the socket (it is a phase). But, as in a household network low frequency, current will go very small and it is necessary "to arm" for its registration with the microammeter. It is possible to connect instead of the microammeter the condenser / (plus the rectifier) and to load it some minutes then to pull together its connections wires and to observe a spark.

** Just the household network is grounded or connected to big electric capacitance.

CHAPTER 2. CALCULATION OF THE TRANSFERRED POWER.

Calculation is made for low frequencies of an electricity transmission. For high there will be differences. The main is that the geometrical sizes of stores of the receiver will cease to influence the accepted power as these conductive bodies won't manage to be filled for a half-cycle with charges. It is confirmed in work[10].

CALCULATION OF POWER FOR THE FIRST WAY OF A SINGLE-WIRE ELECTRICITY TRANSMISSION.

We will take an interval of time (t) equal to a half-cycle ($t=T/2$) of the frequency (ν) of switchings of the direction of a current of charges at a single-wire electricity transmission. This time throughout which the store of the receiver is connected by the conductor to the transmitter store possessing at this stage charges of some one sign, or "+" or "-". And these charges are redistributed so that to form an equipotential surface, i.e. charge the receiver store until electropotential on it isn't equal to transmitter store electropotential.

Stores, in all schemes provided in article are condensers which one facing is a surface of their physical body, and other-infinity. Therefore, according to a well-known physical formula for the condenser, we can write that the charged store possesses energy ($W1$), calculated on a formula (2.1).

$$(2.1) W1 = C \times \Phi^2 / 2$$

Where C - the electric capacity, Φ - potential.

While capacitor charging time (τ) is defined by (2.2).

$$(2.2) \tau = r \times C, \text{ where } r - \text{resistance of the conductors going to the condenser.}$$

As it was stated above, according to a series of experiments of N. (the same can be read and in works of other authors [2, 3]) follows that at a single-wire electricity transmission resistance of the conductors going to the store is insignificant a little. With what physical process it was possible to explain it, it is specified in Chapter 1. Therefore, it is insignificant a little and time of charging of the store (condenser). According to it, it is possible to fill a surface of the store which is on the receiver almost instantly. But what follows for calculation of the transferred power from here? And that we can reduce somehow time of a half-cycle (t) considered by us at calculations follows from this and respectively increase the frequency of an electricity transmission (ν), after all they are connected by a formula (2.3):

$$(2.3) \nu = 1/T = 1/2t, \text{ or } t = 1/2\nu$$

the store of a receiver will always manage to be loaded in time $= t$.

The basic formula for the power ($P1$) says:

(2.4) $P1 = W1/t$ Reducing (t) we increase the transferred power. We will substitute in a formula (4) expression for (t) from a formula (2.3). We will receive:

$$(2.5) P1 = 2 \times \nu \times W1$$

So it is possible to draw a conclusion. The transferred power is directly proportional to the frequency of an electricity transmission (ν). Now question. To what level we can increase frequency? Restrictions "from above" following. At increase of frequency losses on the electromagnetic radiation of a wire grow, and they grow in proportion to not the first degree of frequency, as the power received by the receiver, and the second. We will deal with this issue in more detail later when we consider electricity transmission K.P.D. in Chapter 3. Besides, the high frequency and respectively strong electromagnetic radiation, can negatively affect in the medical plan the population of areas where the similar electricity transmission will be carried out. Too high frequency will be included into area of radio frequencies and will create hindrances of broadcasting and a special radio communication. Well and technical capabilities of the transmitter of the electric power, especially powerful, have some restrictions at creation of too high frequency.

Now we will consider other aspect. Influence of the geometrical sizes of the store, on the power received by this receiver. The best, in respect of the maximum electric capacitance at the minimum size, a form of the single store is a form of a sphere. After all at such form charges don't flow down from acute angles. But also other bodies with the carrying-out surface will accumulate charges. In calculations, nevertheless, as they have the general character, we will accept that we have a store of a spherical form. According to a well-known formula, the capacity of the spherical lonely condenser (C) it is equal:

$$(2.6) C = 4 \times \pi \times \epsilon_0 \times R$$

Where ϵ_0 - electric constant, and R - sphere radius. We will substitute this expression in a formula (1). We will receive:

$$(2.7) W_1 = 4 \times \pi \times \epsilon_0 \times R \times \Phi^2 / 2, \text{ or after reduction: } W = 2 \times \pi \times \epsilon_0 \times R \times \Phi^2$$

We will unite formulas (2.5) and (2.7) now and we will find expression for power.

$$(2.8) P_1 = 4 \times \pi \times \epsilon_0 \times \nu \times R \times \Phi^2$$

We see that the transferred power P is proportional to the geometrical sizes of the store of the receiver (to sphere radius - R).

We will consider one more factor - electricity transmission potential. From the received formula (2.8) it is visible that the power of an electricity transmission P is proportional to the potential of Φ on the receiver store in the second degree. Now restrictions on potential. They are connected with safety of the people dealing with such electricity transmission and with loss of energy on the "crown" and leakage of electrons that we will consider later in Chapter 3. Later we will consider intake option where high potentials are only in its isolated part, and the current transfer conductor intended for it are under the usual not alternating (plus / minus) life-threatening potentials. Here it should be noted that though Nikola Tesla also opened that current of high frequency isn't dangerous to the person, if frequency is higher than 700 Hz in case of any potential, but there are sudden interruptions in electrical power supply, and also switching on and switch-offs. The pulses resulting from it can be very dangerous. Therefore, I believe, that insulation is all the same necessary even if we will decide to work at high frequency.

One more aspect. The formula (2.8) is fair for vacuum and is only approximate for the air environment (where dielectric permeability is very close to unit). After all the formula (2.2) on which we base calculation is written for a lonely sphere in vacuum. If we surround the receiver store with a cover, the formula for power will be already another. Store capacity, and transmitted power, will raise if to surround it with the isolating cover with a big dielectric permeability (ϵ). We will remember a formula for the spherical condenser:

$$(2.9) C = (4 \times \pi \times \epsilon \times \epsilon_0) / (1/a - 1/b),$$

where a - the radius of the internal sphere, b - the radius of the external sphere. Here, for example, a ferroelectric material has coefficient of dielectric permeability about 10 in the fourth degree. But it doesn't mean that power will increase in the corresponding number of times. It would be fair only for the two-superficial condenser where all space between facings is filled with dielectric. In our case, one facing is a surface of the store, and the second - infinity, and we can't fill all infinite space with dielectric. Therefore also dependence will be weaker.

Series of experiments of N... shows that the cover from material with big dielectric permeability positively influences amount of the energy transferred to the store. These researches aren't finished yet and within my laboratory conditions hardly in general will be qualitatively executed. But so far all of us can accept that the transferred power depends on thickness of a cover of the store of the receiver and on dielectric permeability of material of which it is made. We will reflect it in a new formula.

$$(2.10) P_1 = K_1 \times f(d, \epsilon) \times \nu \times R \times \Phi^2$$

Where:

K₁ - coefficient, approximately equal (as not all stores of receivers will be the correct spherical form) $4 \times \pi \times \epsilon_0$. K₁ is approximately equal = 1.11×10 to the minus tenth degree.

f - function, with parameters: d - receiver store cover thickness, ϵ - dielectric permeability of material of which the cover is made. $f > 1$.

So, we "will sound" a final formula. Power of single-wire transfer grows in proportion to a potential square on the line, transmission frequency and to the sizes of stores in the first degree and it is influenced positively by the isolating cover of stores (the more thickness and dielectric permeability of material, the better).

It was calculation for the first way of a single-wire electricity transmission. We will consider as affairs with a power for the second way are.

CALCULATION OF POWER FOR THE SECOND WAY OF A SINGLE-WIRE ELECTRICITY TRANSMISSION.

We will define the energy received by object for a half of the period of fluctuations of potential on a power line. It is natural that all this energy is spent in the load located between a transmission line and the store. Work (A) of movement charges (Q) in electric field is defined by a formula:

$$(2.11) A = Q \times \Delta\Phi,$$

where $\Delta\Phi$ - a potential difference of the store of object and the line. To start any half-cycle of transfer, on the line and on the store there will be potentials of a different sign, each of which on the module is equal to Φ . Potential difference $\Delta\Phi = \Phi - (-\Phi) = 2\Phi$.

But, in process of leakage of charges from the store and their passing through the load, potential on the store, we will call it (Φ_2) changes therefore $\Delta\Phi$ is function of quantity of charges on the store. We will write down it so:

$$\Delta\Phi = F(Q)$$

Potential on the line at the movement of charges won't change, as annihilation of charges which now on the line, from revenues to the line of charges of other sign, all the time is compensated by giving to the line charges from the generator.

From the point of view of power, process of passing of electrons through load can be divided into two stages. The first stage where work (A_1) will be made - this movement of all charges from the receiver store (we will assume negative charges) through the load to a power line. This process happens to a total disappearance of charges of this sign on the store and, according to it, transformation of its potential into the zero. The second stage where work (A_2) - this passing through load of charges from the line will be made (in our example positive) to the receiver store before establishment of potential on it (positive) equal to the potential on the line. Thus, the general work or energy (that in this case the same) which is obtained for a half of the period on the load:

$$(2.12) W_2 = A_1 + A_2$$

Despite the fact that we are talking here about the two stages of the process, in fact, in terms of movement of electrons - it is continuous, and the electrons will flow in one direction only. It's just a matter of determining the sign of the charge.

Let's try to calculate the work A_1 .

Elementary work (its differential) will be equal to the multiplication of the potential difference $\Delta\Phi$ on the elementary charge (differential Q).

$$(2.13) dA_1 = \Delta\Phi(Q) \times dQ = F(Q) \times dQ$$

As already mentioned above, the potential difference is a function of the charge on the store $F(Q)$. Let's see how this function can be expressed. With the leakage of charges through the load, it decreases. The potential of the store (Φ_2) is determined by the following formula.

$$(2.14) \Phi_2 = Q / C, \text{ then}$$

$$(2.15) F(Q) = \Phi - (-\Phi_2) = \Phi + \Phi_2 = \Phi + Q / C$$

Substituting this expression into (2.13), we obtain:

$$(2.16) dA_1 = (\Phi + Q / C) \times dQ$$

In order to define work A_1 , we have to take the integral of the expression within the following limits: lower = 0, and the top, equal to the maximum (initial) charge that is $Q_{\max} = C \times \Phi$. After the corresponding calculations which are excessive for bringing here, we will receive:

$$(2.17) A_1 = \Phi^2 \times C + \Phi^2 \times C / 2$$

Now let's calculate the A_2 .

Work or energy of movement of charges, as well as for A_1 , is determined by a formula (2.11). The potential difference between the line and the receiver store ($\Delta\Phi$) is also a function of the charge on this store. Let's see how in this case is defined $F(Q)$. During all process, including at its beginning, potential on the line = Φ . Φ_2 store potential is equal in the beginning 0, but in process of receipt on it charges which pass a way from the line through load, potential grows. Φ_2 is defined by a formula (2.14). Its final value will be Φ . For a potential difference or $F(Q)$ the following formula has to be fair.

$$(2.18) F(Q) = \Phi - \Phi_2 = \Phi - Q/C$$

Elementary work (dA_2) is defined by a formula (2.13). We will substitute in it the expression which is just received by us for a potential difference, i.e. a formula (2.18). We will receive:

$$(2.19) dA_2 = (\Phi - Q/C) \times dQ$$

In order to define work A_2 , we have to take the integral of the expression within the following limits: lower = 0, and the top, equal to the maximum (final) charge that is $Q_{\max} = C \times \Phi$. After the corresponding calculations which are excessive for bringing here, we will receive:

$$(2.20) A_2 = \Phi^2 \times C - \Phi^2 \times C / 2$$

To find the general work or energy emitted on load for a half of the period of an electricity transmission (W_2) we substitute A_1 and A_2 values in a formula (2.12). We will receive:

$$(2.21) W_2 = \Phi^2 \times C + \Phi^2 \times C/2 + \Phi^2 \times C - \Phi^2 \times C/2 = 2 \times \Phi^2 \times C$$

We will compare this formula to a formula (2.1) for the first way and we will see that the energy for a half period received by the object of a current supply at the second way grew by 4 times. We can write down.

$$(2.22) W_2 = 4 \times W_1$$

As all the rest in calculation of power remains the same, it is possible to write down that the power (P_2) too grew by 4 times. Besides, at the second way we receive "bonus" - it isn't necessary to have two stores on the receiver, only one and the same size.

$$(2.23) P_2 = 4 \times P_1$$

We can write for the second method, the formula similar to the formula (2.10), only take into account the increase in the power coefficient. $K_2 = K_1 \times 4$ or approximately equal to 4.44×10^{-10} degrees. So, power for the second way is expressed by a formula:

$$(2.24) P_2 = K_2 \times f(d, \epsilon) \times \nu \times R \times \Phi^2$$

CHAPTER 3. EFFICIENCY OF SINGLE-WIRE TRANSMISSION AND POSSIBLE PROTECTION AGAINST RADIATION.

Efficiency of power transmission can be defined as follows:

Efficiency = (received power / power line input) x 100%

We introduce the notation:

Pr - received power of the receiver.

Pl - losses in the power transmission process.

Power line input = Pr + Pl

Now the expression for the efficiency can be rewritten as follows:

(3.1) Efficiency = (Pr / (Pr + Pl)) x 100%

For ease of calculation, let's divide the numerator and denominator of this formula on the Pr.

(3.2) Efficiency = (1 / (1 + Pl / Pr)) x 100%

Let's denote the ratio Pl / Pr as the alfa,

alfa = Pl / Pr ,

Then formula (3.2) is as follows:

(3.3) Efficiency = (1 / (1 + alfa)) x 100%

We see that change of all function completely depends on changes of a ratio of Pl / Pr = alfa. For ensure of high efficiency, "alfa" shall aim to 0, then efficiency will be hundred percent. How to calculate the "Pr" (the power received by the object receiver) we set in chapters 2 and 5, it is possible to look at formulas (2.10), (2.24) and (5.26). As for "Pl", here we can be guided by the following provisions.

a) Losses on corona discharge and electron leakage. Because of the relatively low voltage on the line (we have introduced this limit for safety reasons), the corona discharge is not possible, and electron leak is very small, and these losses cannot be taken into account.

b) Heating the wire losses - are virtually absent, since it has no resistance to the motion of electric charges. This has been repeatedly described above.

c) Losses on the mechanical oscillation of the conductor. (Repulsion from the magnetic field of the Earth). These losses are due to their insignificance cannot be taken into account (after all, small currents).

g) Losses from radiation of electromagnetic waves.

This is the main power losses in this method of transmission.

Every conductor with alternating current radiates electromagnetic waves, and with increasing frequency energy emitted waves increases sharply (in proportion to the square of the frequency). Electromagnetic waves permanently move away from the wire, and therefore the energy consumption of the radiation waves are the transmission system losses. The radiated energy depends on the amplitude and frequency of current as well as the length of the conductor. The total average power "Nav" emitted by segment conductor with current (short antenna), in which the length "L" is much smaller than the wavelength, is equal to [12]:

(3.4) Nav = Mu zero x L square x Omega in a square x I in a square / (12 x Pi x C) where

Mu zero - a magnetic constant

Mu zero = 4 x Pi x 10 in minus 7 degrees

Pi - constant = 3.14

Omega - frequency

I - maximum current

C - light velocity.

Substituting in this formula the values of the coefficients and the speed of light, and taking into account that Nav = Pl , and the frequency in our article was usually designated as "nu", it is possible to re-write it in the following form:

(3.5) Pl = 1.11 x 10 at minus 16 degrees x L square x nu in square x I in the square

LET'S DERIVE THE FORMULA FOR "ALFA" IN THE SECOND TRANSMISSION METHOD.

Here we give the power received by the receiver of the object "Pr". For the second transmission method, we derived a formula for it in Chapter 2, this is formula (2.24)

(2.24) P2 = K2 x f(d, epsilon) x nu x R x Phi square

Where

f - function, with parameters: d - thickness of the shell of the collector of the receiver, epsilon - dielectric permeability of the material from which the shell is made. f > 1.

R - is the radius of the receiver store

Phi - is the potential on the transmission line

K2 - is approximately equal to 4.44 x 10 at minus 10 degrees. (K2 = 4 x K1)

We replace "P2" by "Pr", then the formula (2.24) takes the following form:

(3.6) Pr = K2 x f(d, epsilon) x nu x R x Phi square

In order to write the relation of formulas (3.5) and (3.6), we must reduce them to uniformity. For this, we express the current "I" in (3.5) in terms of other parameters.

(3.7) I = Q / (T / 2),

Where "T" is the power transmission period (of the line potential change). Since the frequency $\nu = 1 / T$, formula (3.7) can be rewritten in the following form.

$$(3.8) I = 2 \times \nu \times Q$$

"Q" can be expressed through the capacity of the receiver store and the potential on the power line.

$$(3.9) Q = C \times \Phi$$

here $C = K1 \times f(d, \epsilon) \times R$ (watch Gl.2 formulas (2.9) and (2.10))

we will rewrite a formula (3.8).

$$(3.10) I = 2 \times K1 \times \nu \times f(d, \epsilon) \times R \times \Phi$$

Substitute the derived value for "I" in a formula (3.5). We will receive

$$(3.10) I = 2 \times K1 \times \nu \times f(d, \epsilon) \times R \times \Phi$$

Substitute the derived value for "I" in a formula (3.5). We will receive

$$(3.11) P_l = 1.11 \times 10 \text{ at minus } 16 \text{ degrees} \times L^2 \times \nu \text{ in the fourth degrees} \times 4 \times K1 \times K1 \times f(d, \epsilon) \times f(d, \epsilon) \times R \times R \times \Phi \times \Phi$$

Recalling that $K2 = 4 \times K1$, we give here the formula for the received power, the transformed formula (3.6):

$$(3.12) = 4 \times K1 \times f(d, \epsilon) \times \nu \times R \times \Phi^2$$

Now we can write a formula for "alfa", which is the ratio of the right-hand sides of formulas (3.11) and (3.12).

$$(3.13) \alpha = P_l / P_r = K1 \times 1.11 \times 10 \text{ in minus } 16 \text{ degrees} \times L^2 \times \nu \text{ in the third degrees} \times f(d, \epsilon) \times R$$

We substitute here the value for $K1 = 1.11 \times 10 \text{ in minus } 10 \text{ degrees}$.

$$(3.14) \alpha = 1.23 \times 10 \text{ in minus } 26 \text{ degrees} \times L^2 \times \nu \text{ in the third degrees} \times f(d, \epsilon) \times R$$

WE WILL DERIVE THE FORMULA FOR "ALFA" IN CASE OF THE THIRD METHOD OF THE ELECTRICITY TRANSMISSION.

Here 'I' for the formula (3.5) will be defined as follows.

$$(3.15) I = 2 \times \nu \times Q$$

this formula is similar to formula (3.8) for the second method, but 'Q' for the third method is defined differently.

$$(3.16) Q = C \times (\Phi_m + \Phi_l),$$

Where 'Phi m' is the potential of the charging device (an electrostatic machine), And 'Phi l' is the potential on the transmission line (corresponding to 'Phi' for the second method).

The formulas for capacity are similar

$$C = K1 \times f(d, \epsilon) \times R$$

We write the expression for the current:

$$(3.17) I = 2 \times K1 \times \nu \times f(d, \epsilon) \times R \times (\Phi_m + \Phi_l)$$

We substitute 'I' in the formula for the lost power (3.5) with this expression. We get:

$$(3.18) P_l = 1.11 \times 10 \text{ at minus } 16 \text{ degrees} \times L^2 \times \nu \text{ in the fourth degrees} \times 4 \times K1 \text{ in the square} \times f(d, \epsilon) \text{ in the square} \times R \text{ in the square} \times (\Phi_m + \Phi_l) \text{ in the square}$$

Now we give here the power received by the receiver of the object 'Pr'. For the third electricity transmission method, we derived a formula for it in Chapter 5, this is formula (5.26)

$$(5.26) P_r = 2 \times \nu \times K1 \times f(d, \epsilon) \times R \times \Phi_l \times (\Phi_m + \Phi_l)$$

Now we can write a formula for alfa, which will be the ratio of the right-hand sides of formulas (3.18) and (5.26).

$$(3.19) \alpha = P_l / P_r = 2 \times K1 \times 1.11 \times 10 \text{ at minus } 16 \text{ degrees} \times L^2 \times \nu \text{ in the third degrees} \times f(d, \epsilon) \times R \times (\Phi_m + \Phi_l) / \Phi_l$$

We substitute here the value for 'K1' = 1.11 x 10 in minus 10 degrees.

$$(3.20) \alpha = 2.46 \times 10 \text{ in minus } 26 \text{ degrees} \times L^2 \times \nu \text{ in the third degrees} \times f(d, \epsilon) \times R \times (\Phi_m + \Phi_l) / \Phi_l$$

Since the third method of single-wire transmission requires an electrostatic machine, a battery and a DC motor in the receiver, we must also take into account their efficiency. And since the efficiency of the battery and the motor is rather low, on the average 85 and 83 percent respectively, then they, and not the calculated efficiency on the basis of radiation losses, will determine the efficiency of the third method of electricity transmission. We will see this, considering the calculation of the example given in this chapter.

Mean values:

DC motor efficiency = 83%

Battery efficiency = 85%

Efficiency of the electrostatic machine - it was not possible to find the value in the literature. However, what I want to note: if you do not take into account the friction of the brushes (in a large machine, this is a miser), then the main losses will go to the friction of the discs about the air. Leakage charges will be small due to the intended isolation of the stores. There are no braking force fields in the machine, so the efficiency will be high.

Recall the preliminary condition of these calculations: 'L' must be much smaller than the length of the radiated wave. We will provide the table of lengths of waves "VL" and the frequencies "Fr" corresponding to them here. VL and Fr are related by the following relationship: $Fr = c / VL$, where C is the speed of light.

Fr, Hz-----VL, m	
100 Hz-----	3 000 000 m
1000 Hz (1 KHz)-----	300 000 m
10000 Hz (10 KHz)-----	30 000 m
100000 Hz (100 KHz)-----	3 000 m
1000000 Hz (1 MHz)-----	300 m

EXAMPLES.

EXAMPLE N1

Suppose we have a working room with robots that receive electricity for their work. We will use the third method of electricity transmission. The room is equipped with an electrically conductive floor, and the robots themselves contain electric receiver and built- in electric intakes that comes into contact with the floor. The floor measures 100 x 100 m. Transmitters will be on the edges of the floor. Then $L_{max} = 100m$. In order to comply with the above condition, i.e. L (antenna length) should be much smaller than the wavelength of the radiated wave-VL. Assume that $VL_{min} = 1000m$ (ten times more than L_{max}). Let's calculate Fr_{max} , it will be 300 kHz. Let the geometric dimensions of receiver's stores in robots be real and amount to 1 m in diameter. We use the existing Vimschurst electrostatic machine. The electrical potential on the receiver's stores (with insulating sheath) will be equal the potential on this machine and will be 300 kV. The voltage on the power line (and this is the floor), we agreed to use only safe for life and equal to 220 V.

Let's answer the following questions:

- 1) What maximum power can be transmitted to each robot ?
- 2) What is the efficiency of the power line ?

To answer the first question, let us use the formula derived by us in Ch. 5, which determines the power transmitted by the third method of transmission. This is the formula (5.26)

$$(5.26) P_3 = 2 \times Nu \times K_1 \times f(d, \epsilon) \times R \times Fl \times (Fm + Fl)$$

Where:

K_1 - coefficient , approximately equal (as not all stores of receivers will be the correct spherical form) $4 \times \pi \times \epsilon$ zero. K_1 is approximately equal $= 1.11 \times 10$ to the minus tenth degree.

f - function, with parameters: d - receiver store cover thickness, an ϵ - dielectric permeability of material of which the cover is made. $f > 1$.

R - is the radius of the store. In our example it is 0.5 m.

Fl is the potential on the transmission line (its absolute value), in this case, equal to 220V.

Fm is the potential on an electrostatic machine or some other device of an object receiver that recharges its drives (also its absolute value). In this example, equal to 300kV.

Nu is the frequency equal to $Fr_{max} = 300$ kHz.

We substitute these values in the formula. We get $P_3 = 2199.4$ W or about 3 horsepower. Thus, we will be able to give the robots enough power.

Now let's compare what would have happened if we had used the second method of electricity transmission. The formula for the transmitted power for this method was derived in Ch.2. This is the formula (2.24).

$$(2.24) P_2 = K_2 \times f(d, \epsilon) \times nu \times R \times \Phi \text{ square}$$

Where:

f - function, with parameters: d - thickness of the shell of the collector of the receiver, ϵ - dielectric permeability of the material from which the shell is made. $f > 1$.

R - is the radius of the reciever store. In our example it is 0.5 m.

Φ - is the potential on the transmission line

$\Phi = Fl = 220$ V

K_2 - is approximately equal to 4.44×10 at minus 10 degrees. ($K_2 = 4 \times K_1$)

Nu is the frequency equal to $Fr_{max} = 300$ kHz.

We substitute these values in the formula. We obtain $P_2 = 3.22$ W, i.e. Incomparably less transmitted power.

CHAPTER 4. WAYS OF INCREASING THE TRANSMISSION POWER.

Goal is - to create a single-wire electricity transmission, powerful, safe for a human body, at the small sizes of a current collector and at high efficiency and low cost.

Chapter 2 has a formula of power. Frequency and potential increase power, but as it was already specified, there are restrictions. High frequency reduces efficiency creates strong electromagnetic radiation and hindrances, and a lot of

potential on the line may cause a fatal electric shock. In each case it is necessary to define the maximum potential on the line, and the maximum transmission frequency. In some cases, we will be ready to sacrifice high efficiency for increasing transmission power. For example, if the line goes through the taiga or in the desert, and the potential can be increased by high-frequency interference and electromagnetic radiation will not cause much harm, if you set the warning signs. But in the city it's different. In some cases, for example for electric transport transmission line should be no isolated because of the current collectors, respectively, and the potential to be safe. If the transmission line very long, too high frequency can lead to that charges for a half of a half-cycle won't manage to reach the store the receiver as a long wire has inductance which will work for delay. It can be explained from the point of view of the theory of an electrical oscillating circuit. In this case we have a sequential oscillating circuit with the certain natural frequency determined by values of capacity and inductivity. Capacity is a capacity of the receiver store (depends on the geometrical sizes), and inductivity is defined by length of a wire (line). It is known that the largest amplitude will be when the stimulated frequency (transmitter generator frequency) is equal to the natural frequency of a circuit determined by Thomson's formula. When the stimulated frequency is greater than the natural frequency, the value of the transmitted current decreases. A long wire has a large inductivity and will decrease natural frequency of the circuit. With the usual current transmission for small distances and with small geometric dimensions of the drives, we are always "not reaching" to the natural frequency of the circuit, therefore, as the frequency increases, the transmitted power increases, as shown earlier in Chapter 2.

Store capacity and consequently also transfer power, will increase if to surround it with the isolating cover with a big dielectric permeability (epsilon). In each case we define what material, firm or liquid will suit us depending on high cost, technical capabilities of performance and the demanded isolating properties.

Possible to use different physical effects and devices to increase the amount of charge received at halftime (of frequency period). According to the author, suitable Hall effect (the author has even experimental design in this area) and "Stop revolving coil" - as it was first used in the experiments L.I.Mandelstam and N.D.Papaleksi and later in experiments R.CH.Tolman T.D.Stewart.

The author has planned some more improvements (for example poly-cascade electric circuits) of an electricity transmission (increase in power) which need the experimental verification.

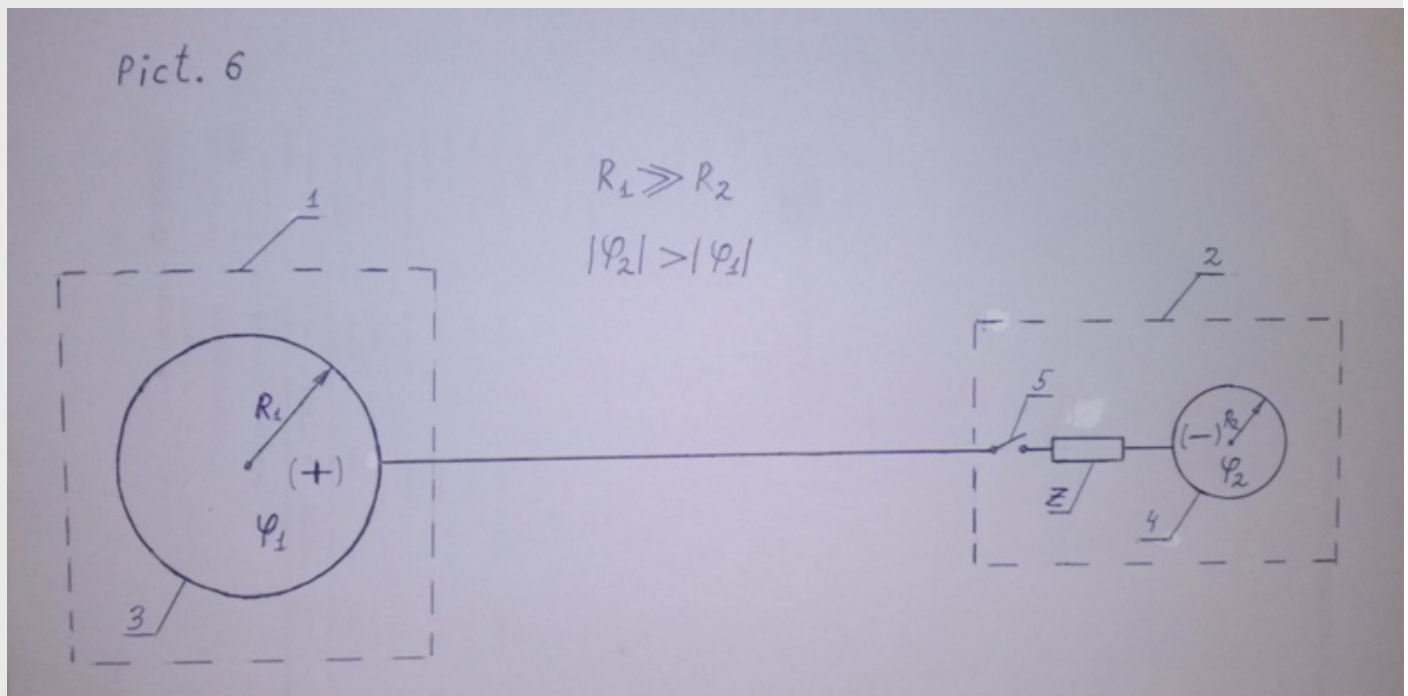
Besides, there is one more option - to apply "the third way of an electricity transmission", though it and more difficult for technical realization in devices, than the first two.

CHAPTER 5. A THIRD WAY OF A SINGLE-WIRE ELECTRICITY TRANSMISSION.

The idea is that for small (comfortable) geometric dimensions of the store of the receiver it would be placed at the half of period a large number of charges, much bigger, than it can place at safe potential on the line. And, potentials on object can be and much more, than on the line. It is admissible from the point of view of safety measures. As the small device of the receiver can be insulated carefully is a small space. But all of a transmission line is very difficult and in some applications as it was stated above, it just also has to be without isolation. This large amount of the charges will be "pumped" through the load toward the transmission line carrying the charges with opposite sign, and despite the fact that we have to expend energy in the beginning (to charge the receiver store) the total received by the load energy will be more than in the first two methods.

We will define this way so - giving of charges to object at safe potential on the line to the object stores, which are previously charged to higher potential, through the loads (which are on object), and charges on stores have to be an opposite sign, in relation to transferred.

This method has been presented long time ago in [1], but was then not well explained. In order to understand how it works, let's solve the small problem in physics, it is shown in Fig.6.



TERMS AND CONDITIONS:

In the transmitter (1) there is a electrically conductive sphere (3) very big sizes which radius we will designate (R_1). On it there are many electric charges, and it is loaded to the potential (Φ_1). It is small potential and it isn't deadly to a human body. Further, the transmitter is connected by one conductor with the receiver (2) in which too there is a electrically conductive sphere (4), but already very modest sizes convenient, say, for the moving object of a current supply. It via the switch (5) and through load (Z) is connected with the line. Radius of this sphere we will designate (R_2). We can write that the radius (R_1) is much more (R_2). The switch is meanwhile opened. The sphere of the receiver is previously loaded to the potential (Φ_2). And this potential is very high much more on the module, than the potential (Φ_1). I think that makes sense to load this sphere (4) by means of an electrostatic machine*. Charges on a sphere of the receiver (4) are opposite on a sign to charges of a sphere of the transmitter (3). Previously having loaded a sphere of the receiver (4) we spent energy (W_{zero}). Now we close the switch (5). What will occur? The author believes that all charges from a sphere (4) through load (Z) will flow on a transmission line on a sphere (3). And, potential on a sphere (3) and on the line will practically not change as a sphere big and has many charges. After all condenser potential, as we know, is defined by a formula:

$$(5.1) \Phi = Q / C ,$$

where Q - amount of charge, and C - capacitance.

Since we chose sphere large geometric dimensions (large R), it has a large capacity (because $C = 4 \times \pi \times \epsilon_0 \times R$) and has a large number of charges. Therefore, a small increase or decrease of the charge, which is necessary for the "work" with the sphere (4) will not greatly affect the potential of the sphere (3) and, consequently, the line. So it will have a real transmitter, as the annihilation of the charges that are currently on the line by entering the line of charges of opposite sign, all the time is offset by applying to the line charges from the generator. Then, part of the charges from the sphere (3), again, through a transmission line and through the load (Z) will flow to the sphere (4) to establish an equipotential surface. I.e. until the potential on the sphere (4) will not be equal to the potential on the sphere (3) and on the line. The potential on the sphere (3) and on the line as before - will not change. Despite the fact that I am talking here about the two stages of the process, in fact, in terms of movement of electrons - it is continuous, and the electrons will flow in one direction only. It's just a matter of determining the sign of the charge. Time we take a half of the period and it more than enough for the described process. On load (Z), as a result of electron flow through it, some energy will be emitted **. We will designate it (W_z).

QUESTION N1: Will the released energy to the load (W_z) more than originally consumed at a charge storage facility (W_{zero})? And if so, how much? The energy difference is denoted (ΔW).

QUESTON N2: To find (W_3)- it is the energy received by object for a half of cycle at such way of an electricity transmission minus originally spent (W_{zero}), and to correlate it to the energy received for the same time at the second way of an electricity transmission (W_2) (it more powerful, than the first way) on the store of the same size (R_2), i.e. the same capacity (C_2), and with the same potential on the line (Φ_1). It all the same what to speak about comparison of power.

AUTHORS' SOLUTION:

The calculation given below, is very similar to the calculation of power for the second way of an electricity transmission given in Ch.2.

Work (A) of movement charges (Q) in electric field is defined by a formula:

$$(5.2) A = Q \times \Delta\Phi,$$

where $\Delta\Phi$ - a potential difference of the sphere (4) and the line. At the beginning on the line and on a sphere (4) potentials of the different sign Φ_1 and Φ_2 . Potential difference

$$\Delta\Phi = \Phi_1 - (-\Phi_2) = \Phi_1 + \Phi_2.$$

But, in process of leakage of charges from a sphere (4) and their passing through the load (Z), potential on a sphere (Φ_2) changes, therefore $\Delta\Phi$ is function of quantity of charges on a sphere (4). We will write down it so:

$$\Delta\Phi = F(Q)$$

From the point of view of power, process of passing of electrons through the load can be divided into two stages. The first stage where work (A1) will be made - this movement of all charges from the receiver sphere (4) (we will assume negative charges) through the load (Z) to a power line. This process lead to a total disappearance of charges of this sign on the sphere (4) and, according to it, transformation of its potential into the zero. The second stage where work (A2) - this passing through the load of charges from the line will be made (in our example positive) to the receiver sphere (4) before establishment of potential on it (positive) equal to the potential on the line (Φ_1). Thus, the general work or energy (that in this case the same) which is obtained for a half of the period on the load:

$$(5.3) W_z = A_1 + A_2$$

Let's try to calculate the work A1.

Elementary work (its differential) will be equal to the multiplication of the potential difference $\Delta\Phi$ on the elementary charge (differential Q).

$$(5.4) dA_1 = \Delta\Phi(Q) \times dQ = F(Q) \times dQ$$

As already mentioned above, the potential difference is a function of the charge on the sphere $F(Q)$. Let's see how this function can be expressed. With the leakage of charges through the load, it decreases. The potential of the store (Φ_2) is determined by the following formula.

$$(5.5) \Phi_2 = Q / C, \text{ then}$$

$$(5.6) F(Q) = \Phi_1 - (-\Phi_2) = \Phi_1 + \Phi_2 = \Phi_1 + Q / C$$

Substituting this expression into (5.4), we obtain:

$$(5.7) dA_1 = (\Phi_1 + Q / C) \times dQ$$

In order to define work A1, we have to take the integral of the expression within the following limits: lower = 0, and the top, equal to the maximum (initial) charge that is $Q_{\max} = C_2 \times \Phi_2$.

After the corresponding calculations which are excessive for bringing here, we will receive:

$$(5.8) A_1 = \Phi_1 \times \Phi_2 \times C_2 + \Phi_2^2 \times C_2 / 2$$

Now let's calculate the A2.

Work or energy of movement of charges, as well as for A1, is determined by a formula (5.2). The potential difference between the line and the receiver sphere ($\Delta\Phi$) is also a function of the charge on this sphere. Let's see how in this case is defined $F(Q)$. During all process, including at its beginning, potential on the line = Φ_1 . Φ_2 sphere (4) potential is equal in the beginning 0, but in process of receipt on it charges which pass a way from the line through the load, potential grows. Φ_2 is defined by a formula (5.5). Its final value will be Φ_1 . For a potential difference or $F(Q)$ the following formula has to be fair.

$$(5.9) F(Q) = \Phi_1 - \Phi_2 = \Phi_1 - Q/C$$

Elementary work (dA_2) is defined by a formula (5.4). We will substitute in it the expression which is just received by us for a potential difference, i.e. a formula (5.9). We will receive:

$$(5.10) dA_2 = (\Phi_1 - Q/C) \times dQ$$

In order to define work A2, we have to take the integral of the expression within the following limits: lower = 0, and the top, equal to the maximum (final) charge that is $Q_{\max} = C_2 \times \Phi_1$.

After the corresponding calculations which are excessive for bringing here, we will receive:

$$(5.11) A_2 = \Phi_1^2 \times C_2 - \Phi_1^2 \times C_2 / 2 = \Phi_1^2 \times C_2 / 2$$

To find the general work or energy emitted on loading for a half of the period of an electricity transmission (W_z) we substitute A1 and A2 values in a formula (5.3). We will receive:

$$(5.12) W_z = \Phi_1 \times \Phi_2 \times C_2 + \Phi_2^2 \times C_2 / 2 + \Phi_1^2 \times C_2 / 2$$

Now we will try to find the answer to the question N1

According to the formula of calculating the energy of the charged capacitor determine W_{zero} :

$$(5.13) W_{\text{zero}} = \Phi_2^2 \times C_2 / 2$$

$$(5.14) \Delta W = W_z - W_{\text{zero}}$$

We will substitute in a formula (5.14) expressions for W_z and for W_{zero} , we will receive:

$$(5.15) \Delta W = \Phi_1 \times \Phi_2 \times C_2 + \Phi_1^2 \times C_2 / 2$$

Thus, we see that we won power, and quite significantly, because the potential Φ_2 can be very high, since the compact means of generating (eg electrostatic machines ***) - are available, and the means of isolation**** - the same.

LET'S ANSWER THE QUESTION N2.

We will consider energy which will receive object of a current supply in our task (at the third way of an electricity transmission) for a half of the period of an electricity transmission. We designated it as W_3 above. We already found one component of W_3 - it is ΔW - the energy emitted on load minus originally spent energy on store charging. Besides, the receiver store, having received a charge from the line of transfers (at the end of process) and therefore having got the potential Φ_1 , receives some power status, i.e. potential energy W_p which we too have to consider at calculation of a total energy W_3 received by the receiver. Later, by consideration of a question of providing a continuity of an electricity transmission at the third way, it will be explained how to use this energy. So,

$$(5.16) W_3 = \Delta W + W_p$$

We will find W_p on a formula of calculation of energy of the charged condenser:

$$(5.17) W_p = \Phi_1^2 \times C_2 / 2$$

We will substitute the found expressions for ΔW and for W_p in a formula (5.16). We will receive:

$$(5.18) W_3 = \Phi_1 \times \Phi_2 \times C_2 + \Phi_1^2 \times C_2 / 2 + \Phi_1^2 \times C_2 / 2 \text{ and after transformation:}$$

$$(5.18) W_3 = \Phi_1 \times \Phi_2 \times C_2 + \Phi_1^2 \times C_2$$

We will compare this expression to the energy received by the receiver at the second way of an electricity transmission for a half of the period - W_2 . The formula for W_2 we learn in Chapter.2 It is a formula - (2.21). Φ in it it is possible to replace with Φ_1 , and C with C_2 . So: (2.21) $W_2 = 2 \times \Phi_1^2 \times C_2$

In order to compare the energy W_3 and W_2 , introduce the measure - n . This value shows how many times the potential of previously charged receiver store - Φ_2 is more than a potential on the line - Φ_1 . We can write:

$$(5.19) \Phi_2 = n \times \Phi_1$$

We will substitute Φ_2 with the found now expression for Φ_2 in a formula (5.18). We will receive:

$$(5.20) W_3 = n \times \Phi_1^2 \times C_2 + \Phi_1^2 \times C_2$$

and after transformation:

$$(5.20) W_3 = (n+1) \times \Phi_1^2 \times C_2$$

Now you can see what will be equal to the ratio of W_3 and W_2 ?

$$(5.21) W_3/W_2 = [(n+1) \times \Phi_1^2 \times C_2] / [2 \times \Phi_1^2 \times C_2]$$

and after reduction:

$$(5.21) W_3 / W_2 = (n+1) / 2$$

ANSWER TO A QUESTION N1:

$$\Delta W = \Phi_1 \times \Phi_2 \times C_2 + \Phi_1^2 \times C_2 / 2$$

ANSWER TO A QUESTION N2:

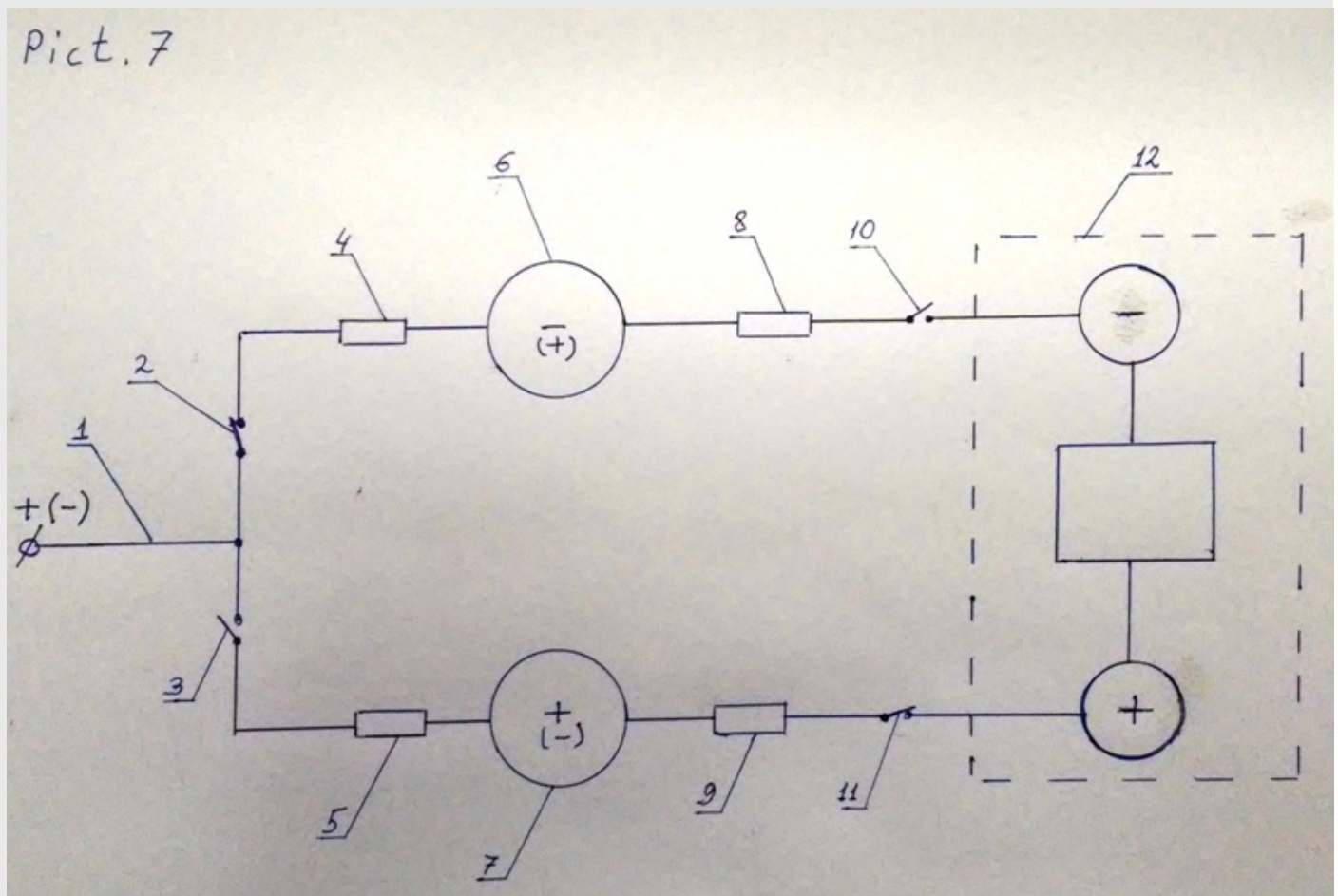
$$W_3 / W_2 = (n+1) / 2 ,$$

$$\text{where } n = \Phi_2 / \Phi_1$$

CONCLUSION :

At the third way of single-wire transfer, the power received by the receiver will increase almost in one thousand times in comparison with the first two ways. So, if to take the potential produced by electrostatic machine of Vimshurst = 300 kV - it there will be Φ_2 and potential on the line = 200 V - it will be Φ_1 (potential, safe for human life, on the standard canons), n will be 1.5×1000 , and W_3 relation to W_2 on a formula (5.21) will be equal about 750. But Vimshurst's electrostatic machine - it yet not a limit of perfection. Such task - to create the electrostatic machine developing the maximum voltage at the minimum sizes wasn't set for mankind simply yet. So, in ONE THOUSAND TIMES it is quite possible to reach increase in power.

PROVIDING CONTINUITY OF THE ELECTRICITY TRANSMISSION.



The diagram (Pict. 7) displays only the object of current supply and appropriate to it single-wire transmission line segment (1). The transmitter remains same what it was at the first and second ways of an electricity transmission (see Pict. 1-5).

In this scheme it is impossible to put a two diode switch 'diode fork' on an entrance of the object of a current supply as at the first way (see Pict. 4). Because of the fact, that previously charged object stores (6 and 7) will electrically connect with each other. However, through loads (4 and 5), but so they won't save up charges, and will lose the potentials, and to us, at this way of transmission, it is necessary that they had many charges at high potentials. Therefore we will use the operated switches (2 and 3).

Loads (8 and 9) between terminals of the electrostatic machine (12) and stores of object (6 and 7) are necessary for purpose to use the energy W_p formed as a result of a charge of stores by charges of an opposite sign (in relation to output terminals of the electrostatic machine) at the end of time of connection of each of them to a power line. This energy will be used when the store is switched-off from a transmission line and connected for charging to the electrostatic machine by means of the operated switch (10 or 11).

What happens in the first period of the power supply we have already discussed in detail above in the solution of the task (see. also Fig. 6).

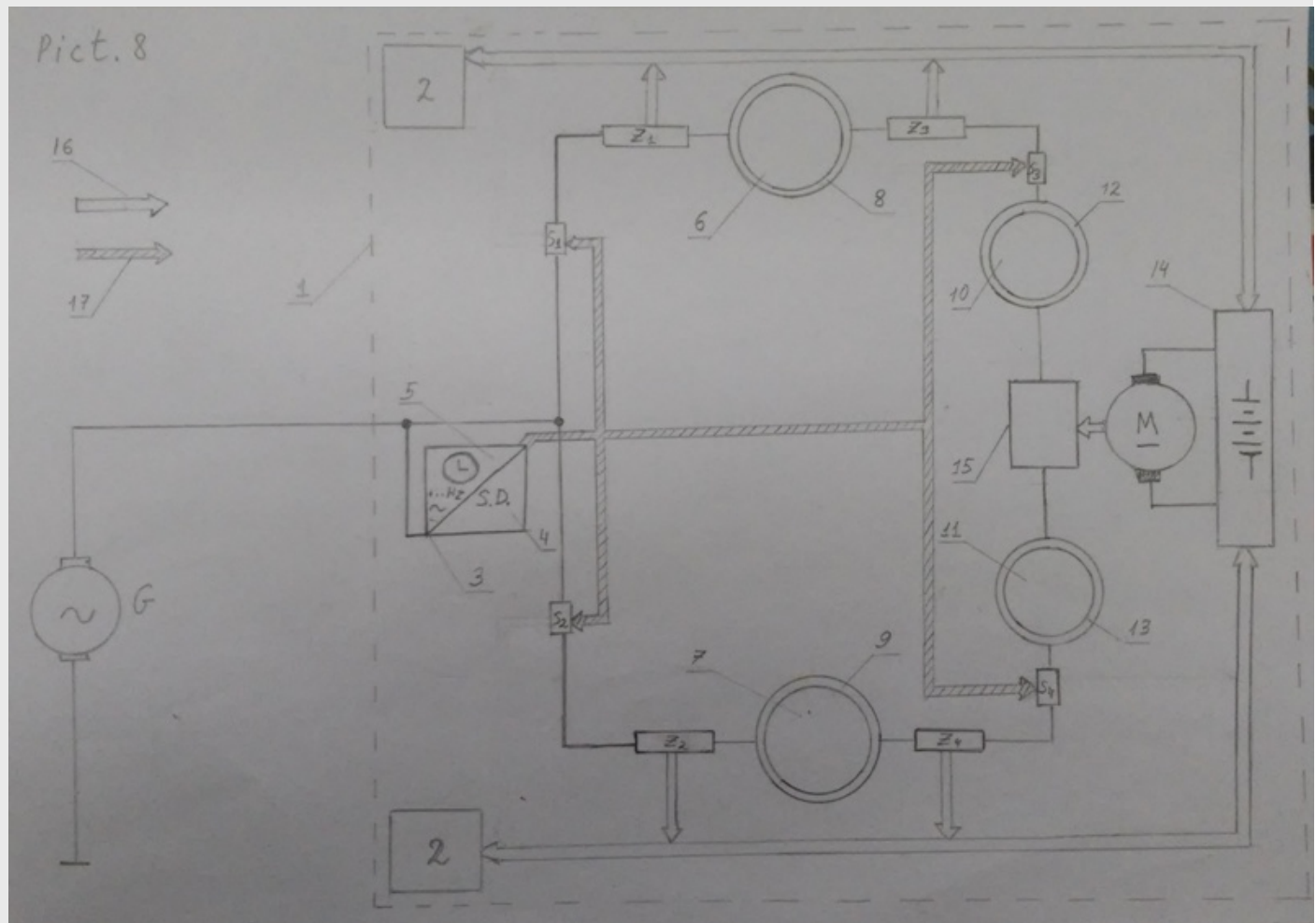
For providing a continuous electricity transmission, on object of a current supply (see Fig. 7) there is a second store (the best form - sphere) which is previously charged with electric charges of other sign, than the first, and in the second half of the period we switch a transmission line to it through other load (4 or 5). And on the transmission line itself already the charge sign too will be changed, because of connection of other sphere of the transmitter (or operation of the generator). And in this half-cycle too everything will occur as in the considered task. In that part of the period when any store of object is switched-off from the line, it will be loaded on the object with the help, we will tell, the electrostatic machine or other device, but in the beginning of this half-cycle it will give the charge, which remained from the previous half-cycle, through the corresponding load (8 or 9) connecting it to the charger. Thus the power status received from the line of transfers at the previous half-cycle (W_p) will be used through this load.

If to compare this process to charging of the neutral store, yes, it is valid, the part of charges going from the electrostatic machine, equal to "spaciousness" of the store of the receiver $Q = C \times \Phi$ at the potential of line $= \Phi_1$ will be annihilated, and must be "restored" by electrostatic machine. This of course would require additional energy (compared to charging a neutral store) from the electrostatic machine, but it will be "returned to us" (the truth with small losses which we don't consider in this calculation) i.e. will turn in "useful" as it will be allocated on load, and from loads we take energy for return to the electrostatic machine and on performing of useful work.

Algorithm of operation of the switches operated (naturally automatically) the following: in the first half-cycle switches (2) and (11) are closed, and opened (3) and (10). And in the second - are closed (3) and (10), and are opened (2) and (11). In the third half-cycle - as in the first, and in the fourth - as in the second etc.

When selecting receiver stores shells material at the third way, it is necessary to pay attention not only to dielectric permeability of material, as at the first two, but also to its electric durability as we will deal with high and life-threatening voltage. Besides, it is necessary to look how these properties of material will behave with the planned electricity transmission frequency (it concerns also the first two ways). Cost too should be considered.

ELECTRO-RECEIVER OF OBJECT OF A ELECTRIC POWER SUPPLY, WORKING AT THE THIRD WAY OF ELECTRICITY TRANSMISSION.



Pict. 8 SCHEME OF THE ELECTRO-RECEIVER OF OBJECT OF A ELECTRIC POWER SUPPLY, WORKING AT THE THIRD WAY OF ELECTRICITY TRANSMISSION.

Signatures to Pict. 8

- 1-Object of a electric power supply.
- 2-The consumer of the electric power on object.
- 3-The block defining sign of charges on a power line.
- 4-The device defining a sign of charges on the line by means of the scheme of a single-wire electricity transmission.
- 5- The operating electric clock.
- 6,7-Stores of charges of object (main).
- 8,9-Isolating covers of the main stores.
- 10,11- Stores of charges of the electrostatic machine.
- 12,13-Isolating covers of stores of the electrostatic machine.
- 14-Rechargeable battery.
- 15-Electrostatic machine.
- 16-Energy stream.
- 17-Flow of managing signals.
- Z1, Z2, Z3, Z4-Loads**.
- S1, S2, S3, S4- The Operated switches.

TRANSFER OF THE ELECTRIC POWER ON OBJECT IN THE PRESENCE OF A SIMILAR COLLECTOR IS CARRIED OUT AS FOLLOWERS.

The generator (G) delivers on a power line charges of a different sign, in each half-cycle different, in one half-cycle - plus, in others-minus. And as he is connected by one terminal to the buffer store (in this example it is Earth - the grounding displayed on the scheme), these charges are "free", i.e. capable to fill a surface of conductors. You can object to this term, but how then to distinguish charges that could put a battery or generator in an electrical circuit connecting the two their terminals from the charges that capable to fill surface of free conductors and to interact with the same "free" charges? In any battery or generator "outside forces" divide charges. But from a terminal of the ordinary battery or the generator they are able to flow only on other terminal of the same device. Even to the terminal of other battery with an opposite sign they won't begin to flow. And in the Earth they won't begin to flow just like that (with an empty second terminal). Otherwise the situation is with the source given in the scheme and with electrostatic machines in which "outside forces" work too. It turns out that presence of "outside forces" for development of "free charges" - the necessary condition, but insufficient as mathematics say.

On a current collector 1 to which lead a line there is a Unit 3. A purpose of this unit - to define what charges in this half-cycle are on the line (plus or minus). If the unit is connected to the line, then it with it is helped by the device switch 4 (the device 4 is given as an example, also other options, say, the device consisting of diodes, electroscopes and optical sensors are actually possible - petals of electroscopes will cross beams), which operation we will consider later. But it can not be connected, then the sign of charges is defined by means of Clock 5 which are synchronized with the generator. The second purpose of the Unit 3 is development and a message of the operating signals on the operated switches (S1, S2, S3, S4). Passing of the operating signals on the scheme is conditionally designated by a stream 17 (the shaded arrows). These signals will depend on what charges (on a sign) in this half-cycle on the line of an electric supply.

On a current collector 1 are the electrostatic machine 15 and its stores of charges (10, 11) with the isolating covers (for safety) (12,13), the accumulator 14, the DC motor (M) for rotating the disk of electrostatic machine. All this "housekeeping" is necessary to receive more 'free' charges from the power line which is under the low potential, safe for life. The motor takes the electric power from the accumulator, puts the electrostatic machine in action and that charges the stores, one (we will tell 10) with positive charges, and another (we will tell 11) negative. This process goes constantly to all the time of an electricity transmission, irrespective of the fact which in this half-cycle charges (positive or negative) on the line going to a current collector. It is thought that the energy received on loads (Z1, Z2, Z3, Z4) quite will be enough both for recharge of the accumulator and for providing consumers of energy 2 objects. Streams of energy 16 are designated on the scheme by not shaded arrows.

The basic working elements of a current collector are stores of charges (6 and 7) and above-mentioned loads (Z1, Z2, Z3, Z4). Stores are surrounded with covers (8 and 9). These covers have double function: to increase the storage capacitor capabilities of stores, dielectrics of which they consist if surround the conductor, then with success it is done, and to isolate stores for safety reasons as on stores there will be sometimes a high voltage. By the way, the case of all current collector has to be made of the good insulating stuff capable to protect the person from high voltage.

We will notice that at the beginning of any half-cycle one of stores of object (6 or 7) has to be completely charged from the store of the electrostatic machine (10 or 11) and have the high potential, equal with him, and another has to begin to be loaded from other store through one of the loads (Z3 or Z4).

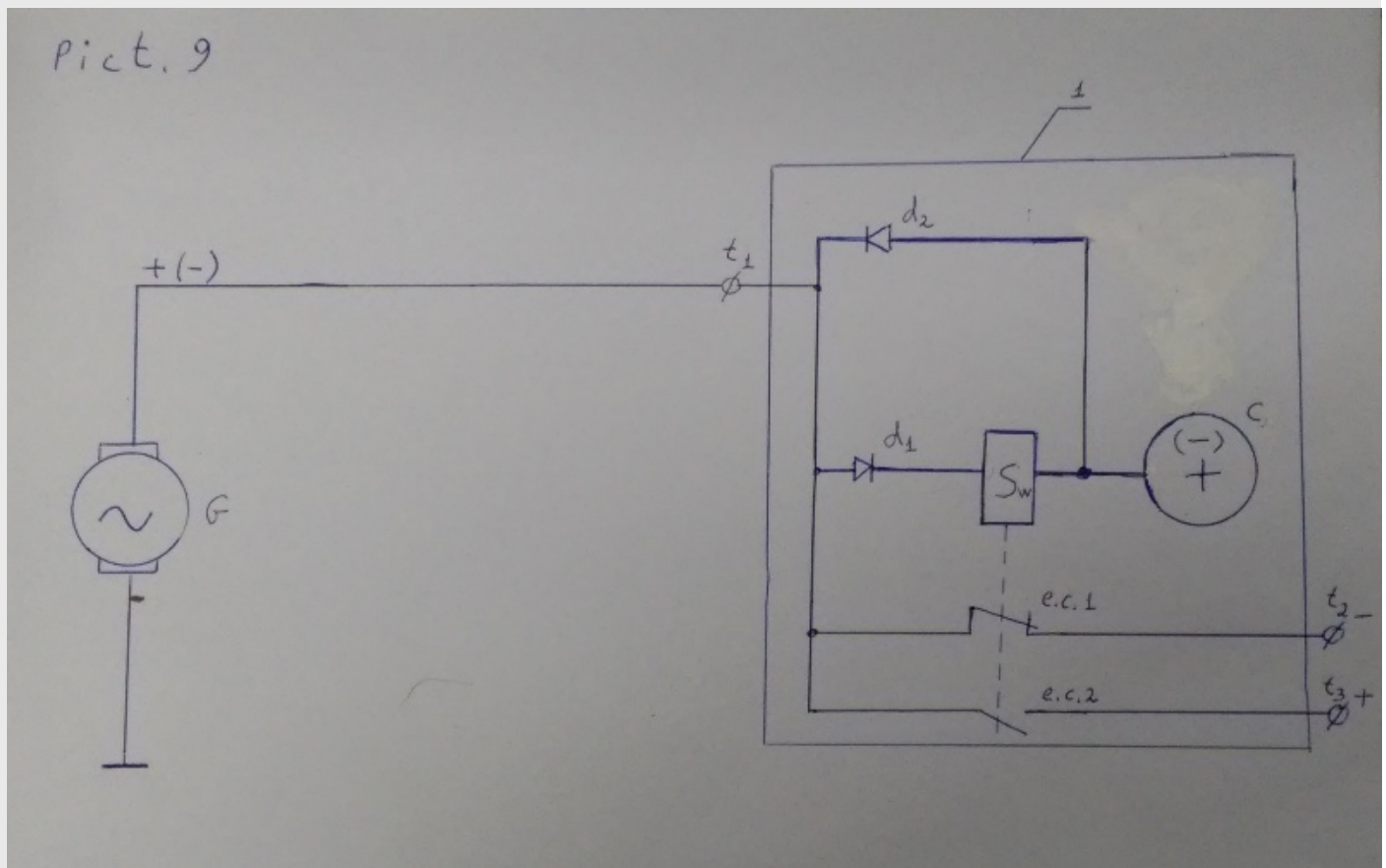
We will consider a "negative" half-cycle in the beginning. On the line the negative charge, the store 6 is loaded positively to the potential of the electrostatic machine (it 'inheritance' of the previous "positive" half-cycle), the S1 switch is open, the S3 switch is closed, the S2 switch is closed, the S4 switch is open. What is going on? The store 6 and the line interact through Z1 load, this process has been described above, on load energy is emitted, she is shown by not shaded arrow departing from her. Energy goes to the consumer of energy 2 objects and for accumulator charging 14. At the end of this half-cycle, the store 6 will get a negative charge and potential of the line and will transfer this "inheritance" to following, already "positive", half-cycle of an electricity transmission. The store 7 in the same time interacts with the store of the electrostatic machine 11 through S4 load. On the store 7 a positive charge and potential of the line (which has got to it "in inheritance" from the previous "positive" half-cycle) and at the end of this "negative" half-cycle it will be charged from the store 11 negatively and will get the potential of the electrostatic machine. From load Z4 energy will go to the same purposes.

Now, on the line "comes" the "positive" half-cycle. The Unit 3 "feels" it and "sends telegrams" on the shaded arrows on the operated switches. As a result S1 and S4 are closed, and S2 and S3 - open. The store 7, having high negative potential from last half-cycle, interacts with the line through Z2 load, at the end of a half-cycle he will get a positive charge and potential of the line. And the store 6, having a negative charge and potential of the line, interacts with the "positive" store 10 of the electrostatic machine through Z3 load. At the end of this half-cycle he will get the high positive potential equal to him.

When on the line again "come" "negative" half-cycle, object stores again, will have, the "inheritance", described right at the beginning. And the Unit 3, "having understood a situation", will open S1 and S4 and will close S2 and S3.

And so on everything will cyclically occur.

SWITCH *****OPERATING DEPENDING ON A SIGN OF CHARGES ON A POWER LINE.



Pict. 9. THE SWITCH *****, ACTING IN ACCORDANCE WITH THE SIGN OF THE CHARGES ON THE POWER LINE.

This switch - unit 4 from the previous diagram (Figure 8).

1- the housing.

Sw- relay.

C-store of charges.

e.c.1- normally closed contact.

e.c.2- normally open contact.

Operation of this device is as follows.

As already mentioned above, the apparatus 4, part of unit 3 (scheme 8) should provide recognition charge sign which currently are in the single-wire transmission line as well as production and send control signals to the switches (S1, S2, S3, S4). Charges from a transmission line enter on the t1 plug. After it they are waited by the diode fork of d2 - d1. If positive charges, they, seeking to fill the store C, pass through the d2 diode and a winding of the Sw relay, having turned on this relay. If charges on the line the negative, then positive charges from the store C via the d1 diode go to the line (and are annihilated with the negative charges of the line) and pass a Sw relay winding. The Sw relay in this half-cycle will be in a silent state - there is no current through a winding.

Thus, depending on the operation or non-operation switch Sw charges recognition occurs on the line.

So:

When "+" charges on power line running to the object, the relay Sw is triggered (current passes through its winding) closes its contact e.s.2 that supplies currents (control signals) to the relay coil switches S2 and the S3, and, thus opens them. Normally closed contact e.s.1 thus opens and stops the currents flow (control signals) via a relay coil S1 and S4 and thus disables them.

If '-' charges on the transmission line, the relay Sw is de-energized, contact e.s.1 closed. He sends control currents to the relay S1 and S4 switches and opens them. e.c.2 - open. He stops for the currents in the windings of relay controlled switches S2 and S3, and disables them.

Pict. 9 SWITCH, OPERATING DEPENDING ON A SIGN OF CHARGES ON A POWER LINE.

This device includes the device 4 and the operated S1 and S2 switches from the previous scheme (Pict. 8).

Signatures to Pict.9

1- housing.

Sw- relay.

C- storage charges.

e.c.1- normally closed contact.

e.c.2- normally open contact.

FORMULA FOR POWER AT THE THIRD WAY OF THE SINGLE - WIRE ELECTRICITY TRANSMISSION.

Let's consider energy which will be received by object of an electric power supply at the third way of an electricity transmission for a half of the period of an electricity transmission. We already found it above and wrote for it a formula (5.18) having designated as W3.

$$(5.18) W3 = \Phi_{i1} \times \Phi_{i2} \times C2 + \Phi_{i1}^2 \times C2$$

Now for larger simplicity and clarity we will change designations and we will explain them. W3 is replaceable on A, Φ_{i1} to Φ_{il} , Φ_{i2} to Φ_{im} . C2 can be replaced just with the simple C.

Let's rewrite taking into account new designations a formula (5.18), now it will become a formula (5.22).

$$(5.22) A = \Phi_{il} \times \Phi_{im} \times C + \Phi_{il}^2 \times C,$$

or

$$(5.22) A = C \times (\Phi_{il} \times \Phi_{im} \times C + \Phi_{il}^2),$$

or

$$(5.22) A = C \times \Phi_{il} \times (\Phi_{im} + \Phi_{il})$$

Here :

A - the energy transferred to the object for half frequency period.

C - the capacity of one of receiver stores (there are two identical stores).

Φ_{il} - potential on a transmission line (its absolute value).

Φ_{im} - the potential of an electrostatic machine or some other device, which charges receiver stores (also its absolute value).

To find the power (denoted by P3), it is necessary to divide the work (A) on the time for which we have found it. We shall take an interval of time (t) equal to a half-cycle ($t=T/2$) of the frequency (ν) of switchings of the direction of a current of charges in case of a single-wire electricity transmission. Write a formula.

$$(5.23) P3 = A / t = A / (T / 2), \text{ but the } T = 1 / \nu, \text{ so, finally, this formula is as follows:}$$

$$(5.23) P3 = 2 \times \nu \times A$$

Substitute in this formula the expression for A (formula 5.22). We get: (5.24) $P3 = 2 \times \nu \times C \times \Phi_{il} \times (\Phi_{im} + \Phi_{il})$.

Now let's express storage capacity through the other parameters, as we did for the counting capacity of the first and second methods in the Chapter 2.

$$(5.25) C = K1 \times f(d, \epsilon) \times R$$

Where:

K1 - coefficient, approximately equal (as not all stores of receivers will be the correct spherical form) $4 \times \pi \times \epsilon$ zero. K1 is approximately equal $= 1.11 \times 10$ to the minus tenth degree.

f - function, with parameters: d - receiver store cover thickness, an ϵ - dielectric permeability of material of which the cover is made. $f > 1$.

R- is the radius of the store

Substituting this formula in the expression for power. We get:

$$(5.26) P3 = 2 \times K1 \times f(d, \epsilon) \times \nu \times R \times \Phi_{il} \times (\Phi_{im} + \Phi_{il}).$$

We will compare this formula to the formula derived by us in Chapter 2 for the power transferred in case of the second method of an electricity transmission (formula 2.24).

$$(2.24) P2 = K2 \times f(d, \epsilon) \times \nu \times R \times \Phi_i^2,$$

where Φ_i is a potential on the line, i.e. it is Φ_{il} in the present designations, and $K2 = 4 \times K1$

We can rewrite a formula (2.24) in the following look now

$$(2.24) P2 = 4 \times K1 \times f(d, \epsilon) \times \nu \times R \times \Phi_{il} \times \Phi_{il}$$

and to compare it to a formula (5.26). We see that in a formula for the third method, one of multiplicands (Φ_{il}) is replaced on $(\Phi_{im} + \Phi_{il})$. And as Φ_{im} is a potential of the electrostatic machine, and it much above Φ_{il} , so delivered power for the third method will be much higher.

There is a question why in the case of count of power for the second method of an electricity transmission we didn't consider the potential energy W_p received by the store at the end of a half-cycle? But for the third - consider? - Because, this potential energy, we "transfer" without using in the following half-cycle (only on the next time span it brought benefit)- second way. And here (third way) we its, truth, transfer too without using in the present half-cycle, but we receive it (not its, it is more correct correct to say - equal to it) on the other store in the same interval of time, i.e. in a "estimated" half-cycle. Energy is received in the beginning of charging from the electrostatic machine of the parallel store on the appropriate load (Z3 or Z4 - see the Diagram 8).

We will remind that calculation is made for low frequencies of an electricity transmission. For high there will be differences. The main is that the geometrical sizes of stores of the receiver will cease to influence the accepted power as these conductive bodies won't manage to be filled for a half-cycle with charges. It is confirmed in work[10]

NOTES :

* The author has an idea how to make an electrostatic machine with a miniature mechanism, i.e. does not take up much space on the receiver of the object, and without rubbing brushes - collectors. In fact, this idea belongs Kirsanov B.P., but the author of this article it creatively developed and perfected.

** The load, as noted in Chapter 1, should be in the form of a winding motor or transformer because of the three manifestations of the electric current (electromagnetic, thermal, chemical) with single-wire electric power transmission guaranteed only one thing - electromagnetic.

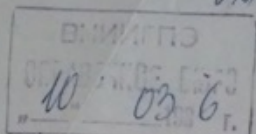
*** Wimshurst electrostatic machine, for example, with relatively small size, gives us 300 kV.

**** So, for example, electric durability of mica =135 kV/mm, polyethylene makes 40 kV/mm, and ebonite and porcelain = 25 kV/mm. Therefore , the insulation thickness of only a few cm can protect from breakdown at voltages of above-stated electrostatic machine.

***** If we want to define a sign of the plug of the battery or other device which isn't (like a given above transmission line) a source of 'free' charges, it is necessary to connect the second plug of the battery to the 'buffer' store of charges, i.e. to the big conducting body or to the Earth.

CHAPTER 6. OUR EXPERIMENTS .

The test report of the our pilot unit, executed according to the scheme of Pict. 4.



В Государственный Комитет СССР по делам
изобретений и открытий,
во ВНИИГТО

По поводу заявки 355 9986/07 033494
от Института [redacted]

АКТ ИСПЫТАНИЙ УСТРОЙСТВА

Настоящий акт подтверждает, что в лаборатории №3 отдела №6
Института [redacted] 17 января 1986г. было проведено испытание
модели установки, которая была собрана по схеме, соответствующей
описанию заявки на изобретение "Устройство для передачи электро-
энергии" № 355 9986/07 033494.

В качестве источника питания использовалась стандартная
промышленная электросеть /250В/. К изолированной установке шел
только один проводник длиной 7м, сечением 0,8мм². В качестве нако-
пителей зарядов использовались 4 картонные параллелепипеды /по
два на каждый вид зарядов/, обмотанные металлической фольгой
/размеры параллелепипедов 25х25х40см/. Коммутационные проводники
были длиной приблизительно по 1м и сечением 0,8мм². Функцию
электрических вентилях выполняли диоды марки Д247. Включенный
последовательно с нагрузкой 5,1МОм микроамперметр марки М366
М109III показывал ток около 10мкА.

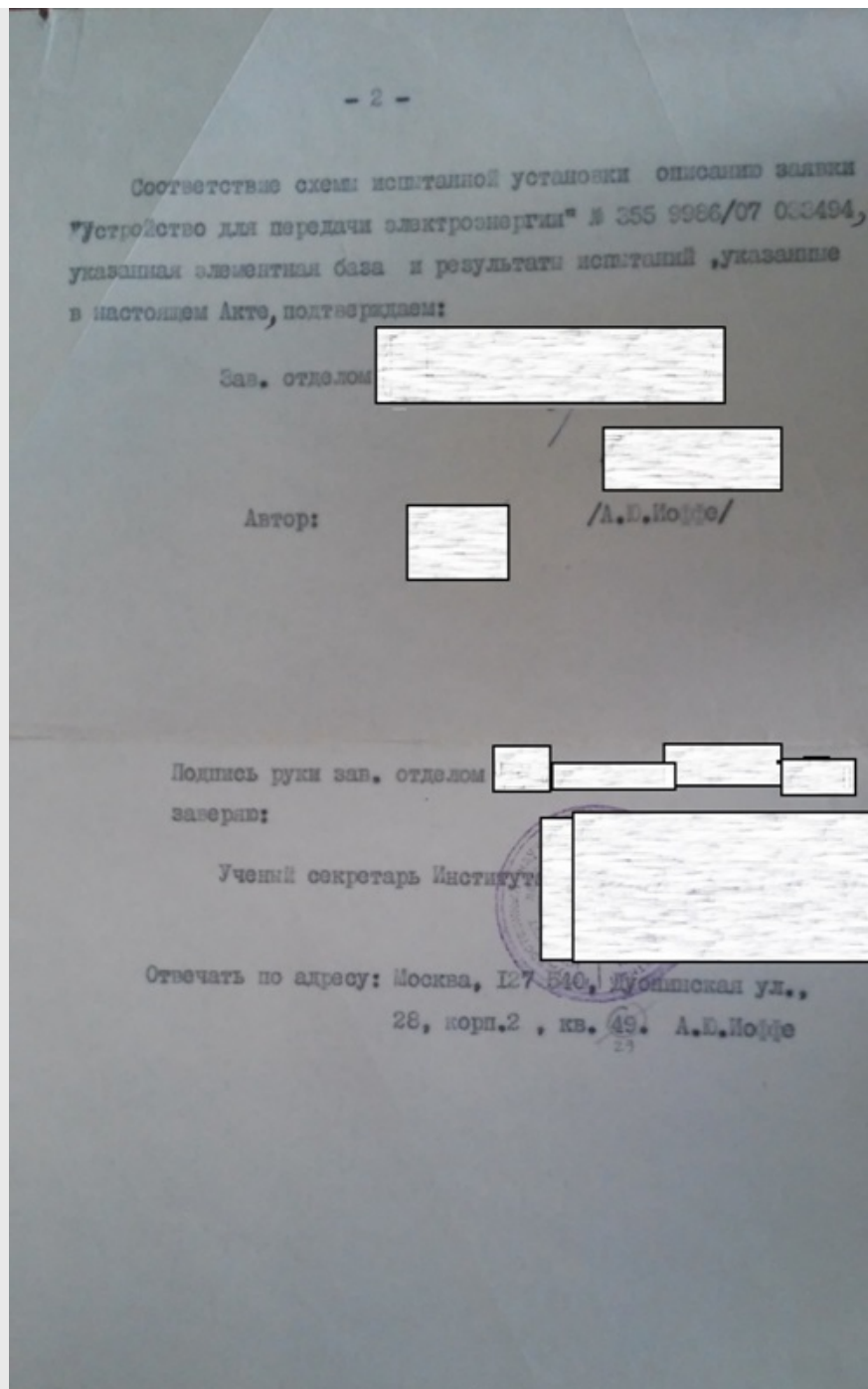
Таким образом, возможность протекания тока через нагрузку
/что ранее оспаривала экспертиза/ была доказана.

На испытаниях присутствовали:

Эксперты ВНИИГТО В.А.Круглова, К.Н.Сотина

Зав.отделом [redacted]

От авторов: сотрудник отдела №6 [redacted] А.В.Иоффе



Translation :

CHAPTER 7. A SINGLE-WIRE POWER TRANSMISSION APPLICATIONS.

So we see that the ability to transmit electricity at one conductor to an isolated object, still weak, but still there. But there is a question, and for what purpose in general these should be engaged?

The author according to his fancy may suggest the following applications.

1. Power supply of the mobile objects contacting to the conductive firm surface / the liquid environment. It can be, for example, robots with the built-in intakes, and the floor of the machine hall will be carrying out. The single-wire electricity transmission won't be, unlike two-wire, to limit their mobility. Charging or change of accumulators won't be required. Still it can be vehicles on an electricity conductive roadbed. I will remind that I had long ago, in the USSR, article on this matter [1]. Now, when everywhere in big cities there are separate road strips for public transport, it can be real. It is only necessary to make these strips electricity conductive (for the person if only he isn't grounded" contact with such strip won't constitute big danger). It is optional to do conductive this strip on all width, for the maneuvers which aren't interrupting electricity contact of a slip ring will be in it a narrow strip enough. It is natural that these objects of a current transfer have to have the corresponding current collectors where as stores their conducting cases or part them can serve. In addition, for ensuring electric contact there have to be slip rings representing, for example, freely turning conducting castors. Water

crafts in the electrolytic environment, including salty water can also be mobile objects of a current transfer. We will imagine an artificial pond with the sea or added some salt water and with the electricity isolated bottom. On it the boats with electric motors possessing the corresponding current collectors [4] can move.

2. Information electricity transmission when it is difficult to ground or duplicate the line carrying current and information (providing the second conductor). Such situations are rare, but, nevertheless, sometimes, can meet. Then, having the corresponding equipment, by means of such electricity transmission we can transmit signals modulating its parameters. For example, it is possible to transfer information and even energy on the metal pipe which isn't contacting to the earth.

3. It is possible to try to use such way of transfer of the electric power and information on monorail roads.

4. Power supply zeppelin having conductive body (huge storage charges) by means of thin cables coming from the ground. The cable for each zeppelin will be only one. Also will be a thin wire, with the coaxial carrying-out cover intended for prevention of an exit outside of the electromagnetic radiation which can be harmful to all live and, besides, will create a radio noise. It is possible to imagine and the return electric energy when on the zeppelin solar batteries are installed on all its surface, and the cable transferring the developed energy to the earth there will be a single thin wire with a coaxial cover as such cable will be easier and won't pull the zeppelin strongly down, owing to that that the wire can be very thin at a single-wire electricity transmission.

5. Transfer of the electric power on such single-wire lines to the isolated objects will save metal of electricity cables, and not because a wire only one, after all single-wire lines, are already applied to the grounded objects, and because wires can be made thin owing to other mechanism of conductivity which hypothesis of action is given above in Chapter 1. However, as reception objects it will be necessary to build buildings of the big sizes with the electricity conductive cases which, however, can be used in economy, say, as warehouses. Wires, as it was noted above, it is necessary to envelope in the shielding cover. And, even despite it, in view of the small diameter of such coaxial cables, the economy of metal is possible.

6. Transfer of electric power / information on the conductor or the channel having gaps. It can be both the metal conductor, and the interrupting stream of electrolyte. About possibility of a single-wire electricity transmission on not continuous conductor it is possible to read in work [4]. Besides, it is confirmed by a series of experiments... in this work.

7. Transmission of electricity / information between two crafts / vehicles upon contact of their bodies. The shells must be conductive, but not over the entire surface, otherwise we will encounter the "Faraday cage" effect.

8. Single-wire transmission of electricity in the plasma channel formed in the air by means of a laser beam. For information, energy and military purposes.

9. For medicine. For diagnostic devices.

10. Disinfection conductive surfaces. Nikola Tesla discovered that high frequency currents and high voltages have a bactericidal effect. For some conductive surfaces, especially hard-moving and rotating, bactericidal transfer currents may be more convenient for just one conductor and not two.

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Bellow are photocopies of:

requests for registration of inventions and the article in the Magazine "Inventors and Innovators"

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(22) Дата поступления заявки 9 НОЯБРЯ 1981

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о приеме к рассмотрению заявки на изобретение

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ЭЛЕКТРОПРОВОДЯЩЕЕ ШОССЕ

СОЗДАНИЕ ЭКОЛОГИЧЕСКИ ЧИСТОГО, ДЕШЕВОГО И НАДЕЖНОГО ТРАНСПОРТА — ОДНА ИЗ ВАЖНЕЙШИХ ИНЖЕНЕРНЫХ ЗАДАЧ ВО ВСЕМ МИРЕ. МНОГИЕ УМЫ ЗАНЯТЫ СЕЙЧАС РАЗРАБОТКОЙ РАЦИОНАЛЬНЫХ КОНСТРУКЦИЙ ЭЛЕКТРОМОБИЛЕЙ. АВТОР СЧИТАЕТ, ЧТО ЭТИ ПОИСКИ ИДУТ НЕ ВСЕГДА В ТОМ НАПРАВЛЕНИИ, ГДЕ ДЕЙСТВИТЕЛЬНО МОЖНО БЫЛО ОЖИДАТЬ ПРИНЦИПИАЛЬНО НОВЫХ ВОЗМОЖНОСТЕЙ.

А. ИЮФФЕ, инженер

Третья экологически чистая, но чересчур «прямливая», троллейбус чуть маневреннее, но не может оторваться от проводов. Непригодность на линии и троллейбуса, и трамвая выводит из строя весь маршрут, свободнее чувствует себя электромобиль, но ему приходится тащить в кузове громоздкие аккумуляторы, а это не чинное, как бесполезное превышение мощности: иными словами, низкий КПД. И на большой пробег по населенной расчитывать не приходится — без подзарядки аккумуляторов не обойтись.

Вот если бы удалось сделать орожное полотно так, чтобы его верхний слой стал токопроводящим, а нижний был изоляционной прокладкой, тогда электромобиль получил бы основную часть энергии от электропроводящего шоссе, а аккумулятор (небольшой, конечно) ставился в резерве — вдруг придется свернуть с основной дороги. Токопроводящий электропроводник в периодическом режиме. В первый полупериод передаем по нему положительные заряды от положительно заряженных накопителей передатчики, а во второй — отрицательные. Накопители на объекте будут предназначены как для зарядов своего знака. Заряды с накопителей на объекте можно снимать через полезную нагрузку R_H (см. рис. 1). В установке, изображенной на рис. 2, в качестве буферного накопителя, принимающего заряды, разделяемые генератором, может быть использована Земля или тело, обладающее большой собственной емкостью.

Вместе с Б. П. Кирсановым, сотрудником Физического института им. П. Н. Лебедева, мы хотели защитить идею этой установки авторским свидетельством на изобретение («Устройство для передачи электроэнергии», заявка № 335520-07 033494), но эксперты ВНИИПЗ отрицали ее работоспособность, не поверили, что ток потечет

По расчетам, передаваемая объекту мощность растет вместе с частотой передачи зарядов разного знака, с увеличением емкости накопителей и потенциала, при котором происходит токопередача. Повысить передаваемую мощность можно, например, таким путем. Перед началом передачи тока на накопители подается заряды под большим потенциалом. Это обеспечит совместную работу небольшой аккумуляторной батареи и устройства, повышающего напряжение (см. рис. 3).

В первый полупериод, когда на проводник от передатчика подаются заряды положительного знака, коммутационное устройство соединяет проводник с накопителем отрицательных зарядов. Ток течет через R_H . Во второй полупериод, когда на проводник отрицательные заряды, коммутационное устройство соединяет проводник с накопителем положительных зарядов, и ток течет через R_H . Часть полезной

Помните с детства школьную физику — разрядки Тери в форме, зарядки чисел друг от друга

через нагрузку (R_H). Тогда мы собрали опытную установку, которая продемонстрировала появление тока в нагрузке. Составили акт испытания модели. Но эксперт, а затем и Контрольный совет ВНИИПЗ отказали нам в авторском свидетельстве, сославшись на то, что мощность, передаваемая объекту, невелика, поэтому наша установка практической ценности не имеет. Но мы и не подавали заявку на новый мощный источник энергии, мы хотели лишь «заострить» идею, и опытная установка доказала работоспособность этой идеи.

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